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1936

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Iowa State University

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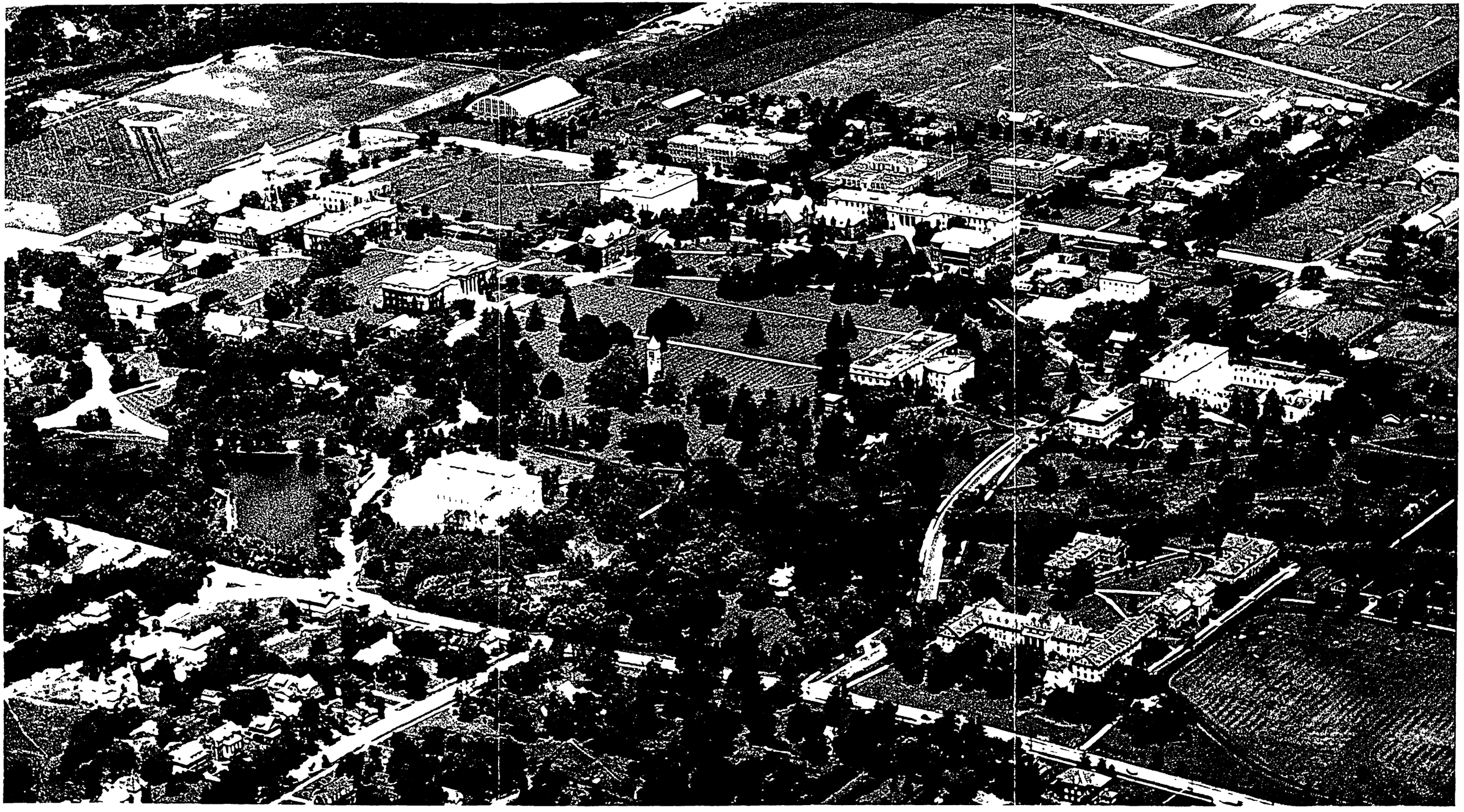
IOWA STATE COLLEGE OF AGRICULTURE AND . . MECHANIC ARTS . . OFFICIAL PUBLICATION

CATALOGUE NUMBER

ANNOUNCEMENTS

1936-1937



IOWA STATE COLLEGE CAMPUS

CAMPUS
IOWA STATE COLLEGE
AMES IOWA

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1936

GOLF COURSE
#1
COLLEGE CEMETERY
GENETICS BUILDING
MILITARY STABLES
INSECTARY
HORSE BARNS
CHICAGO & NORTHWESTERN R R
MUNICIPAL PLANT
HOME MANAGEMENT GROUP
GREEN HOUSE
VETERINARY QUADRANGLE
CATTLE BARN
SHEEP BARN
JUDGING PAVILION
HOG BARN
ARMORY
AGRICULTURAL ENGINEERING
CHEMISTRY BUILDING
PHYSICS BUILDING
SCIENCE BUILDING
MEAT LABORATORY
STOCK PENS
FORAGE CROPS
POULTRY LABORATORY
HOME ECONOMICS
PARKING AREA
LIBRARY
MARGARET HALL
BOTANY HALL
PLANT LABORATORY
GREENHOUSES
LANDSCAPE ARCHITECTURE
PARKING AREA
POWER PLANT
OAKLAND ST
USDA BUILDING
CHEMICAL ENGINEERING
PARKING AREA
BOOK STORE
MORRILL HALL
AERONAUTICS LABORATORY
TRANSPORTATION BUILDING
ENGINEERING ANNEX
ENGINEERING HALL
DAIRY INDUSTRY
PARKING AREA
PATTERN SHOP
FOUNDRY
FORGE SHOP
MACHINE SHOP
STEAM & GAS LABORATORY OF MECHANICS
CENTRAL
AGRICULTURAL HALL
AGRICULTURAL ANNEX
TENNIS COURTS
TENNIS COURTS
WEST ST
HOSPITAL
ALUMNI HALL
CAMPANILE
GYMNASIUM
BOWLING GREEN
MUSIC HALL
ELM
OAK
LODGES
ALICE FREEMAN
MARY LYON
ELVIRA QUARTON
WEST STADIUM
STATE FIELD
EAST STADIUM
MEN'S DORMITORY
LAKE LAVERNE
MEMORIAL UNION
THE KNOLL
WELCH HALL WEST
WELCH HALL EAST
LINCOLN WAY
TO AMES
SHELDON AVE
HAYWARD AVE
WELCH AVE
TO DAIRY POULTRY HORT & AGRONOMY FARMS
STANTON AVE
LYNN AVE
ASH AVE
GRAY AVE
BEECH AVE
TO ANIMAL HUSBANDRY & VETERINARY FARMS

IOWA STATE COLLEGE OF AGRICULTURE AND . . MECHANIC ARTS . . OFFICIAL PUBLICATION

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ANNOUNCEMENTS
1936-1937

VOLUME XXXIV, NO. 41 MARCH 11, 1936

AMES, IOWA

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College Calendar

1936-1937

The General Faculty has one regular meeting each quarter and other called meetings. The faculties of the different divisions meet each month as follows:

First Monday, 4:15 P. M. . . . . Home Economics
Wednesday, following first Monday, 4:15 P. M. . . . . Engineering
Thursday, following first Monday, 4:15 P. M. . . . . Agriculture
Second Monday, 4:15 P. M. . . . . Industrial Science

This calendar is subject to change at any time

1936

SUMMER QUARTER

FIRST TERM

June 16, Tuesday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
June 17, Wednesday, 7:00 A. M.	Class Work Begins
June 22-24, Monday to Wednesday	Rural Life Conference
June 24-26, Wednesday to Friday	Girls 4-H Convention
July 23, Thursday, 5:00 P. M.	First Term Closes

SECOND TERM

July 23, Thursday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
July 24, Friday, 7:00 A. M.	Class Work Begins
August 29, Saturday, 12:00 M.	Second Term Closes

FALL QUARTER

September 16, Wednesday, 9:00 A. M.	Opening Faculty Convocation
September 17, Thursday, 8:00 A. M. to 12:00 M.	Entrance Examinations
September 17-18 Thursday and Friday	Examinations in Back Work
September 17-21, Thursday, 1:00 P. M. to Monday, 5:00 P. M.	Freshman Days
September 21, Monday, 8:00 A. M. to 5:00 P. M.	Registration-Classification for all Except new Freshmen & Sophomores
September 22, Tuesday, 8:00 A. M.	Class Work Begins
October 1, Thursday, 11:00 A. M.	Divisional Convocations
October 29, Thursday	Mid-Quarter Reports Due
November 4, Wednesday	Final Date for Filing Diploma Slips for Fall Quarter
November 26, Thursday	Thanksgiving Day—Holiday
December 12, Saturday, 8:00 A. M.	Final Examinations Begin
December 18, Friday 10:00 A. M.	Final Examinations Close
December 18, Friday, 10:30 A. M.	Graduation Exercises
December 18, Friday, 12:00 M.	Fall Quarter Closes
December 28-30, Monday to Wednesday	Boys Short Course

1937

WINTER QUARTER

January 2, Saturday	Entrance Examinations and Examinations in Back Work
January 4, Monday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
January 5, Tuesday, 8:00 A. M.	Class Work Begins
February 4, Thursday	Mid-Quarter Reports Due
February 8-13, Monday to Saturday	Farm and Home Week
February 8, Monday	Final Date for Filing Diploma Slips for Winter Quarter
February 15-20, Monday to Saturday	Dairy Manufacturing Short Course
March 15, Monday, 1:00 P. M.	Final Examinations Begin
March 20, Saturday, 10:00 A. M.	Final Examinations Close
March 20, Saturday, 10:30 A. M.	Graduation Exercises
March 20, Saturday, 12:00 M.	Winter Quarter Closes

SPRING QUARTER

March 22, Monday	Entrance Examinations and Examinations in Back Work
March 25, Thursday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
March 26, Friday, 8:00 A. M.	Class Work Begins
April 29, Thursday	Mid-Quarter Reports Due
May 3, Monday	Final Date for Filing Diploma Slips for Spring Quarter.
May 30, Sunday	Memorial Day
June 4, Friday, 1:00 P. M	Final Examinations for Seniors Begin
June 7, Monday, 8:00 A. M.	Final Examinations for Other Students Begin
June 9, Wednesday, 5:00 P. M.	Senior Work Closes
June 11, Friday, 5:00 P. M.	Final Examinations Close
June 11, Friday, 8:00 P. M.	Senior Promenade
June 12, Saturday	Alumni Day
June 13, Sunday, 10:30 A. M.	Baccalaureate Sermon
June 13, Sunday, 3:00 P. M.	President's Reception
June 14, Monday, 10:00 A. M.	Commencement

1937

SUMMER QUARTER

FIRST TERM

June 15, Tuesday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
June 16, Wednesday, 7:00 A. M.	Class Work Begins
July 22, Thursday, 5:00 P. M.	First Term Closes

SECOND TERM

July 22, Thursday, 8:00 A. M. to 5:00 P. M.	Registration-Classification
July 23, Friday, 7:00 A. M.	Class Work Begins
August 28, Saturday, 12:00 M.	Second Term Closes

SPECIAL EVENTS CALENDAR

FALL QUARTER, 1936

September 17, Thursday, 7:30 P. M.—Freshman Mixer
September 18, Friday, 7:30 P. M.—Freshman Entertainment and Reception, Divisional Deans and Student Councils Hosts.
September 25, Friday, 7:30 P. M.—All College Mixer—Y. W. C. A.—Y. M. C. A.
September 26, Saturday, 8:00 P. M.—President's Reception
October 9, Friday, 7:30 P. M.—Ward Round-Up
October 10, Saturday, 8:00 P. M.—Harvest Ball
October 30, Friday, 5:30 P. M.—Cardinal Guild Barbecue
October 30, Friday, 9:00 P. M.—Pep Dance
October 31, Saturday—Homecoming, University of Oklahoma Football Game
November 14, Saturday, 8:00 P. M.—Engineers' Carnival and Dance
November 21, Saturday—Dads' Day—Drake University Football Game
November 21, Saturday, 8:00 P. M.—Home Economics Dance
December 5, Saturday, 8:00 P. M.—Junior Prom
December 6, Sunday, 5:00 P. M.—Girls' Glee Club Candle Light Service
December 13, Sunday, 3:30 P. M.—"The Messiah"

WINTER QUARTER, 1937

January 9, Saturday, 8:00 P. M.—Annual Veterinary Informal
January 14-17, Thursday through Sunday—Annual All-College Religious Meetings
January 23, Saturday, 8:00 P. M.—Industrial Science Dance
January 30, Saturday, 8:00 P. M.—Women's Panhellenic Formal
February 6, Saturday, 8:00 P. M.—Engineers' Ball
February 8-13, Monday through Saturday—Farm and Home Week
February 10, Wednesday, 7:15 P. M.—Little International
February 13, Saturday, 6:00 P. M.—All-Dormitory Formal Dinner Dance
February 20, Saturday, 8:00 P. M.—Men's Panhellenic Formal Dance
February 27, Saturday, 8:00 P. M.—Ward System Dance
March 6, Saturday, 8:00 P. M.—Military Circus

SPRING QUARTER, 1937

March 26, Friday, 8:15 P. M.—Good Friday Program
March 27, Saturday, 8:00 P. M.—Men's Glee Club Concert
March 28, Sunday, 7:45 P. M.—Easter Service
April 3, Saturday, 8:00 P. M.—Annual Bomb Ball
April 4-6, Sunday through Tuesday—Cessna Lectures
April 10, Saturday, 8:00 P. M.—Annual Agricultural Ball
April 17, Saturday—Science Day—Division of Industrial Science
April 17, Saturday, 8:00 P. M.—Freshman-Sophomore Ball
April 24, Saturday, 8:00 P. M.—Military Ball
May 1, Saturday, 8:00 P. M.—Varsity "I" Carnival and Dance
May 13, 14, 15, Thursday, 10:30 A. M. through Saturday, 11:30 P. M.—VEISHEA
May 27, Thursday, 6:00 P. M.—Honors Day Banquet
June 11, Friday, 8:00 P. M.—Senior Promenade

Iowa State Board of Education

GEO. T. BAKER, President . . . . . DAVENPORT
W. H. GEMMILL, Secretary . . . . . DES MOINES

MEMBERS OF BOARD

TERMS EXPIRE JULY 1, 1937

HARRY M. NEAS . . . . . SIGOURNEY
J. H. ANDERSON . . . . . THOMPSON
THOMAS W. KEENAN . . . . . SHENANDOAH

TERMS EXPIRE JULY 1, 1939

CORA E. SIMPSON . . . . . DECORAH
S. J. GALVIN . . . . . SHEFFIELD
HENRY C. SHULL . . . . . SIOUX CITY

TERMS EXPIRE JULY 1, 1941

GEO. T. BAKER . . . . . DAVENPORT
ANNA B. LAWTHER . . . . . DUBUQUE
JOHN P. WALLACE . . . . . DES MOINES

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Building and Business Committee—S. J. GALVIN, HARRY M. NEAS, THOMAS W. KEENAN, CORA E. SIMPSON, GEO. T. BAKER.

FINANCE COMMITTEE

W. R. BOYD, Chairman . . . . . CEDAR RAPIDS
WM. G. NOTH . . . . . DES MOINES
W. H. GEMMILL, Secretary . . . . . DES MOINES

BOARD ON SECONDARY SCHOOL RELATIONS

W. H. GEMMILL, Chairman . . . . . DES MOINES

IOWA COMMITTEE OF THE COMMISSION ON SECONDARY SCHOOLS OF THE NORTH CENTRAL ASSOCIATION

W. H. GEMMILL, Chairman . . . . . DES MOINES

Officers of Administration

RAYMOND MOLLYNEAUX HUGHES, M.S., LL.D. . President, Acting Director of Agriculture
CHARLES EDWIN FRILEY, B.S., A.M., LLD. . . . Vice President, Dean of Industrial Science
CHARLES HENRY STANGE, D.V.M. . . . . Dean of Veterinary Medicine, Director of Veterinary Research
ROBERT EARLE BUCHANAN, Ph.D. . . . Dean of Graduate College, Director of Agricultural Experiment Station
RALPH KENNETH BLISS, B.S.A. . . . . Director of Agricultural and Home Economics Extension
DANIEL C. FABER. B.S., E.E. . . . . Director of Engineering Extension
JOHN ELDEN FOSTER, B.A. . . . . Dean of the Summer Quarter
GENEVIEVE FISHER, B.S., A.M. . . . . Dean of Home Economics
T. R. AGG, B.S., C.E. . . . . Dean of Engineering, Director of Engineering Experiment Station
HERBERT HENRY KILDEE, B.S.A., M.S. . . . . Dean of Agriculture
MAURICE D. HELSER, B.S.A., M.S. . . . Dean of Junior College, Director of Personnel for Men
FRANCES A. SIMS, Ph.B., M.S . . . . Director of Personnel for Women
MRS. MADGE I. MCGLADE, B.S. M.S. . . . . Director of Housing
MARGARET GRAHAM STANTON . . . . . Director of Social Life
GEORGE WILLIAM GODFREY, B.S.A., M.Agr. . . Assistant to the President in Agriculture
CHARLES FRANKLIN CURTISS, D.S. . . . . Senior Dean of Agriculture
ANSON MARSTON, C.E., D.Engr. . . . . Senior Dean of Engineering
MARIA M. ROBERTS, B.L. . . . . Senior Dean of Junior College
JAMES R. SAGE, B.A., M.S. . . . . Registrar, Vice Dean of Junior College
HUGH CARLETON GREGG, Ph.B., A.M. . . . Business Manager and Secretary
JAMES FRANKLIN EDWARDS, M.D. . . . . College Physician
CHARLES HARVEY BROWN, A.B., A.M., B.L.S. . . . . Librarian
C. B. MURRAY . . . . . Treasurer
NELSON P. HORN, A.B., B.D., M.A. . . . . Director of Religious Life

ADMINISTRATIVE BOARD

President R. M. HUGHES, chairman; AGG, R. E. BUCHANAN, GENEVIEVE FISHER, J. E. FOSTER, FRILEY, HELSER, KILDEE, STANGE, BERGMAN, BLISS, C. H. BROWN, EDWARDS, GODFREY, GREGG, C. B. MURRAY, LANCELOT, P. MABEL NELSON, SIMS, STEVENSON, VEENKER; SAGE, Secretary.

OFFICERS OF INSTRUCTION—SEE PAGE 316.

General Information

ADMINISTRATION

The laws of the United States and the State of Iowa provide for the scope and the management of the State College of Agriculture and Mechanic Arts. It is under the State Board of Education, which consists of nine members nominated by the Governor and confirmed by the Senate. This board appoints a finance committee consisting of three men who give their entire time to the management of the five state educational institutions of Iowa of which the Board is in charge, under provisions of the law and such rules and regulations as the State Board of Education may prescribe.

GOVERNMENT

The discipline of the College is confined mainly to dismissing those who prove, on fair trial, to be too independent to submit to needful authority or too indifferent to take advantage of their opportunities. The final decision in all cases of discipline rests with the President of the College, except when he delegates such power in particular cases to the Deans or to some one of the standing committees of the Faculty.

HISTORY

The following chronological table gives some of the significant dates in the history of the college.

1858 March 22. Establishment of The Iowa State College of Agriculture and Mechanic Arts by act of the Seventh General Assembly.

1859 Purchase of original farm of 648 acres, including the College Campus.

1860—1861. Erection of the Farm House.

1862 July 2. Approval by President Abraham Lincoln of the Morrill Land-Grant College Act donating public lands to the several states and territories to provide for colleges for the benefit of Agriculture and Mechanic Arts.

September 11. Acceptance of grant by Iowa.

1865—1868. Erection of the "Main Building."

1868 May 11. Appointment of A. S. Welch, M.A., LL.D., as President.

1868 Oct. 21, to 1869, Mar. 15. Service of George W. Jones, M.A., Acting President, during President Welch's absence in Washington, D. C., as U. S. Senator.

1868 Oct. 21 Opening of The College to students.

1869 Completion of first president's residence.

1869 Erection of the house known as "The Maples."

1870 Erection of the house now occupied by Dean Marston.
1870 Purchase of the North Farm. 140 acres of this farm still owned by the college.
1870 Erection of first part (30 feet by 60 feet one-story with basement) of the Chemical Laboratory.
1871 Addition of two wings to the "Main Building."
1875 Addition of Physical and Chemical Laboratories, 70 feet by 40 feet—3½ stories, including basement, to east side of Chemical Laboratory constructed in 1870.
1879 Erection of first creamery, 16 feet by 24 feet, east of Farm House.
1880 Erection of boarding cottage for young men, "Stanton Cottage."
1882 July 1 to Nov. 1. Service of Charles E. Bessey, Ph.D., as Acting President during President Welch's absence in Europe.
1882 Erection of Second Boarding Cottage for young men. Site: West of Alumni Hall. Known as "Kirkwood Cottage." Taken down when Alumni Hall was built.
1882 Purchase of 10 acres at northwest corner of original farm.
1883 Dec. 1. Appointment of Seaman A. Knapp, A.M., LL.D. as President.
1883 Erection of "Engineering Hall," now called the Laboratory of Mechanics. Cost $4,500.
1884 Erection of office building for offices of the President, Secretary, and Treasurer.
1884 First installation of electric lights in the Main Building.
1885 Feb. 1. Appointment of Leigh Hunt, A.M., as President.
1885 Erection of the Veterinary Buildings on the site now occupied by Memorial Union.
1886 July 20. Appointment of William I. Chamberlain, A.M., LL.D., as President.
1887 March 2. Passage by Congress of the Hatch Act to promote scientific investigation through Agricultural Experiment Stations in the several states.
1890 August 30. The second Morrill Act for additional endowment.
1891 Feb. 1. Appointment of William M. Beardshear, A.M., LL.D., as President.
1891 Erection of Morrill Hall, to be used as a library, chapel, and museum.
1892 Erection of Agricultural Hall, now called the Botany Building. Cost $37,000.
1892 Erection of Creamery Building, with second-floor dormitory.
1895 Erection of Margaret Hall. This was the first women's dormitory outside of Main Building. Cost $54,000.
1897 Construction of the water tank and water system, designed by A. Marston, Head of Civil Engineering Department.
1897 Erection of forge shop and foundry. Cost $5,000.
1898 Erection of carpentry shop. Cost $5,000.
1898 Purchase of the Kintzley 40 acres as an addition to main farm.
1898 Construction of the sewage disposal plant, as designed by Anson Marston, Head of Civil Engineering Department. These were the first sewer beds built in Iowa.
1898 Erection of carpentry shop. Cost $5,000.

1899 Erection of Campanile. Stanton chime of ten bells installed.
1900 February 28. Granting by The Legislature of the first definite educational support to this college, in the sum of $25,000 per annum.
1900—1903. Erection of Engineering Hall. Occupied January, 1903. Cost $218,500.
1900 Erection of brick horse barn and stock pavilion. Cost $14,588.97.
1900 Erection of President's Residence, "The Knoll."
1900 December—Burning of the north wing of old Main Building.
1902 August 5. Death of President William Miller Beardshear at his home on the Campus.
1902 August 6. Appointment of Edgar W. Stanton, B.S., LL.D., as Acting President.
1903 Sept. 1. Appointment of Albert Boynton Storms, LL.D., as President.
1903 Erection of the fireproof Agricultural Hall Annex, now Botany Annex. Cost $53,752.
1903—1905. Erection of Central Building. Cost $360,000.
1904—1905. Erection of Dairy Building—now called Agricultural Annex. Cost $55,000.
1904—1907. Erection of Alumni Hall. Present home of Y. M. C. A. and Y. W. C. A. Building erected by faculty, alumni, and friends. Cost $35,000.
1905 Purchase of the Dairy Farm of 170 acres.
1906 March 16. Passage by Congress of the Adams Act, which increased the support of Agricultural Experiment Stations.
1906 Purchase of 80 acres northeast and 60 acres northwest of the main farm.
1906 Purchase of 10 acres addition to Dairy Farm, and 20 acres for Poultry Farm.
1906—1907. Erection of Hall of Agriculture. Cost $340,000.
1906 First appropriation by state for Extension Work.
1906 Erection of forge shop. Cost $4,500.
1906 Erection of machine shop. Cost $18,000.
1906—1908. Erection of central heating plant. Cost $165,000.
1907 March 4. Passage by Congress of the Nelson Act for the further endowment of Colleges of Agriculture and Mechanic Arts.
1909—1910. Erection of Engineering Annex. Cost $49,000.
1910 Sept. 1. Appointment of Edgar W Stanton, LL.D., as Acting President.
1910—1911. Erection of Home Economics Building. Cost $75,000.
1910—1912. Erection of Veterinary Buildings. Cost $150,000.
1911—1913. Erection of Gymnasium. Cost $150,000.
1912 Sept. 1. Appointment of Raymond A. Pearson, LL.D., as President.
1912—1914. Erection of the Mechanical Engineering Laboratory. Cost $52,105.
1913 Paving of college roads.
1913—1914 Erection of the Transportation Building. Cost $65,000.
1913—1914. Erection of the Horticultural Laboratory and Greenhouse. Cost $26,000.

1913—1914. Erection of Chemistry Building. Cost $311,032.
1914 May 8. Smith-Lever Act for co-operative agricultural extension work.
1914 Purchase of Agronomy Farm of 165 acres.
1914—1928. Erection of group of dormitories for women in the southeast corner of the campus, at a cost of $758,250. This group consists of five brick buildings: Mary Lyon, Alice Freeman, Clara Barton, and Mary B. Welch, East and West; and four frame buildings: Elm, Alpha and Beta; and Oak, Alpha and Beta.
1917 Feb. 23. Smith-Hughes Act for training teachers in vocational education.
1917 April 20 to Nov. 21, 1918. Service of Edgar W. Stanton, LL.D., as Acting President during the absence of President Pearson on war service with the Department of Agriculture.
1918—1919. Erection of Science Hall. Cost $65,000.
1918—1919. Erection of College Hospital for students. Cost $51,000.
1920 Purchase of Animal Husbandry Experimental Farm. 182 acres. Land south of Lincoln Highway between Beach Avenue and Squaw Creek.
1921 Purchase of Veterinary Investigation Farm—60 acres, and an addition to Poultry Farm—3 acres.
1922 Erection of Physics Building. Cost $258,512.
1923 Erection of Armory. Cost $155,000.
1923—1924. Erection of Library. Cost $626,474.
1924 Erection of addition to College Hospital. Cost $104,200.
1924—1925. Erection of two additional groups of buildings, which have not been mentioned in the above; one the Service Unit for physical plant, which is near the Power Plant, and the other, the New Brick Barns, including the Artillery Stables. Cost $64,600.
1925 Feb. 24. Passage by Congress of the Purnell Act for an increased annual appropriation for Agricultural Experiment Stations and the regulation of the expenditure thereof.
1925 Purchase of additional land for Dairy Farm—25 acres; and for Poultry, Genetics, and Botany—40 acres.
1925—1926. Erection of Home Economics Building. Cost $540,000, including the remodeling of the Home Economics Building, built in 1910-1911.
1926 Feb. 8 to July 17. Service of Herman Knapp, as Acting President during President Pearson's leave of absence in Europe.
1926 Sept. 1. Appointment of Herman Knapp, as Acting President.
1926 Purchase of 10 acres additional land, south of Agronomy Farm.
1927 Sept. 1. Appointment of Raymond M. Hughes, LL.D., as President.
1927 Erection of first unit of Men's Dormitory Group. Cost $148,000.
1927 Reception of gift from Sallie S. Smith estate—"Gables" for International House.
1927—1928. Erection of Dairy Industry Building. Cost $430,000.
1927—1928. Erection of Memorial Union, first unit. Cost $750,000. Built by alumni, faculty, and friends.
1928 May 22. Capper-Ketcham Act for further development of agricultural extension work.

1929 Installation of Stanton Carillon in Campanile. Twenty-six bells added to the original ten bells. Weight 32,000 pounds. Inaugurated Oct. 6 by a concert given by Anton Brees, Belgian Bellmaster.
1930 Horse Barn remodeled for the Department of Landscape Architecture. Cost $20,000.
1930 Addition to Engineering Annex. Cost $8,000.
1931 Erection of Insectary Greenhouse. Cost $6,500.
1931 Addition to Chemical Engineering Building. Cost $13,500.
1933 Genetics Laboratory. Cost $11,500.
1934 Central Stores Building. Cost $35,000.
1934 Agricultural By-Products Laboratory. Erected with Federal funds by the Bureau of Chemistry and Soils of the U. S. D. A. Cost $90,000.
1935 June 29. Act to promote and aid agricultural research, co-operative extension work, and further endow land-grant colleges.

STANDING OF THE COLLEGE

Iowa State College is accredited by the North Central Association of Colleges and Secondary Schools as a degree-granting institution. The College is also fully recognized by the Association of American Universities.

STATEMENT OF INCOME, EXPENSES, AND RESOURCES

For Year Ended June 30, 1935

INCOME:		
EDUCATIONAL AND GENERAL		
Student Fees	$ 323,213.24	
State Appropriation	1,780,000.00	
Federal Appropriation	378,845.44	
Income from Endowment	33,814.88	
Sales and Service	290,918.68	
Gifts	25,250.34	
Miscellaneous	7,172.88	
From Balance Forwarded	7,321.91	
Total Educational Income		$ 2,846,537.37
Auxiliary Activities		266,270.31
Non Educational		9,366.66
TOTAL INCOME		$ 3,122,174.34
EXPENSES:		
EDUCATIONAL AND GENERAL		
Administration	$ 94,454.63	
General Expense	42,274.90	
Instruction and Departmental Research	1,443,419.11	
Organized Research	423,290.21	
Extension Service	453,098.51	
Library	90,225.43	

Operation and Maintenance of Physical Plant	307,916.77	
Equipment	34,406.36	
Total Educational Expense		$ 2,889,085.92
Auxiliary Enterprises		223,215.32
Other Non Educational Expense		9,873.10
TOTAL EXPENSE		$ 3,122,174.34
RESOURCES:		
VALUE OF		
Lands, Buildings and Equipment	$ 10,782,816.16	
Loan Funds	47,228.49	
Endowment Investments	817,557.40	
Other Assets	261,386.45	
TOTAL		$ 11,908,988.50

LOCATION

Ames is almost at the geographical center of the state of Iowa, on the main line of the Chicago & North Western Railroad. It is about thirty-five miles north of Des Moines, with which it is connected by the Chicago & North Western Railroad. A branch of the Chicago & North Western from Ames serves the northern part of the state. Several bus lines pass through Ames making the city accessible by bus from all sections of Iowa and neighboring states.

Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising and cordial. The town has an excellent system of public schools, numerous churches, waterworks, and electric lights, and it also has a good city government. It is an inviting community for heads of families who wish to educate their children and enjoy a good environment at a reasonable expense.

GROUNDS

The entire college domain includes 2,195 acres. The central campus with its beautiful walks and drives, its trees, shrubbery, and flower gardens, and its large and stately buildings is especially attractive.

BUILDINGS AND EQUIPMENT

Seventy buildings for college purposes besides dwelling houses and the buildings for farm stock, machinery, and work have been erected by the State for the various departments of the College. The map in the front of this catalogue gives the names of the buildings and their location. The following is a brief description of the more important buildings and items of equipment:

CENTRAL BUILDING, erected on the site of the old Main Building, accommodates the executive offices, and the Departments of English, Mod-

ern Language, History and Government, Mathematics, Pyschology, and Public Speaking. The building is of gray Bedford stone, built in the Roman Renaissance style, a style that is also used for the Engineering and Agricultural Halls.

LIBRARY BUILDING. For description see page 28.

THE MEMORIAL UNION was opened in the fall of 1928. This million-dollar structure was erected to the memory of Iowa State men and women who served in the World War, and is an all-college social center. Funds for the erection and completion of this building are being provided by pledges from alumni, students, and faculty.

ALUMNI HALL is 87 by 48 feet, colonial style, three stories and a basement. It was built by the alumni and students of the college. On the first floor are reception rooms, reading rooms, and offices of the Young Men's and Young Women's Christian Associations; on the second floor, an assembly room, committee rooms, and social rooms. The third floor is used for dormitory purposes. In the basement are a dining room, a kitchen, and a game room.

DORMITORIES FOR WOMEN. College homes for 700 women students are provided in seven halls. Mary Lyon, Clara Barton, Alice Freeman, Mary B. Welch (West), and Mary B. Welch (East) Halls, are located on a portion of the college grounds set apart especially for the homes of women students. A new residence hall housing 120 women located just north of Mary B. Welch (West) will be ready for occupancy in the fall of 1936. Clara Barton and Alice Freeman Halls are co-operative halls where the women students are able to save approximately one-half the price of board by doing about one hour's work each day. Margaret Hall, a dormitory for graduate students, is located on the central campus. The halls have ample and attractive living rooms. Three of the halls have large recreation rooms. The dining rooms are in charge of a dietitian who furnishes wholesome, well-prepared, balanced meals. An especially qualified hall director supervises the student life in each building. Everything possible is done for the comfort and happiness of the women students.

DORMITORY FOR MEN. A limited number of students make their home in the Men's Dormitory. The dormitory has a splendid location on the campus.

THE INTERNATIONAL HOUSE, long known as "The Gables," a large brick residence in spacious and beautiful grounds, was acquired by the College through the generous bequest of Mrs. Sallie Stalker Smith. This house once occupied by the first President of the College, is now used as a home for male foreign students and as headquarters for the Cosmopolitan Club.

MORRILL HALL, one of the oldest of the College buildings, was named in honor of Justin S. Morrill, the originator of the "Land Grant" for colleges of agriculture and mechanic arts. In it are the zoological museum, the offices of the Agricultural Extension Department, and the bulletin shipping rooms.

THE CAMPANILE is a detached tower 110 feet in height, built of buff brick with terra cotta trimmings. This tower stands in the center of

the campus and contains the Edgar W. and Margaret McDonald Stanton Memorial Carillon of thirty-six bells. These bells were manufactured by John Taylor and Company, of Loughborough, England. Ten of them were imported in 1899 and twenty-six additional bells were added in 1929 changing the chime to a carillon. The Carillon was inaugurated by a concert given by Anton Brees, Belgian Bellmaster, on October 6, 1929.

DIVISION OF AGRICULTURE

AGRICULTURAL HALL is 234 by 78 feet, and four stories in height. It is fireproof throughout, and arranged with suitable conveniences and facilities for efficient work in agricultural instruction and investigation. It contains the offices and classrooms of the departments of Agronomy, Animal Husbandry, Horticulture and Forestry, and Genetics. The Agronomy Department has nine laboratories in this building; these are provided with modern equipment for studying soil fertility, soil management, soil surveying, and soil bacteriology.

THE DAIRY INDUSTRY BUILDING is a two-story structure, 205 by 64 feet, with two one-story wings, each of which is 208 by 40 feet.

The main building contains testing, farm dairy, bacteriology and research laboratories, classrooms, and the general office. The laboratories for the manufacture of butter, cheese, ice cream, condensed and powdered milk and for handling market milk are located in the one story wings.

AGRICULTURAL ANNEX is a three-story brick structure occupied by the Departments of Agricultural Economics, Technical Journalism, and Vocational Education.

THE GENETICS LABORATORY which was completed late in 1932, is a two-story fireproof brick structure 32 by 60 feet in outside dimensions. The building is being used for genetic research in both animals and plants. The basement floor contains animal rooms, an incubation room, feed room and root cellar, while a seed laboratory, general laboratories and office space are provided in the upper floor. The laboratories are equipped for bacteriological and other biological work.

THE HORTICULTURAL BUILDINGS comprise two groups of laboratories, two ranges of greenhouses and various farm buildings. The old Horticultural laboratory is a two-story brick building, the main floor of which is equipped for elementary instruction. It is equipped with a special tool room and a refrigerator to hold fruits in storage for class purposes. The new laboratory, of Bedford stone, houses an experimental cold storage plant, laboratories for advanced research, the experiment station headquarters for horticulture, and potting and sales rooms for the greenhouses.

The principal range of greenhouses adjoins the new laboratory. The houses comprise 33,400 square feet under glass, and are of an approved type of iron frame construction. Altogether there are fourteen houses in this range, mostly 75 by 25 feet. These houses provide facilities for instruction in commercial floriculture, plant propagation, vegetable forcing, and general research work in plant breeding and other horticultural problems.

The farm buildings, in addition to the usual service barns for horses and implements, include a specially constructed seed-curing laboratory and a fine four-cell cool-air storage for plants, vegetables, and fruits.

THE LANDSCAPE ARCHITECTURE BUILDING is a three-story brick structure, 100 by 40 feet, occupied entirely by the Department of Landscape Architecture. The top floor is used for drafting rooms, the ground floor for offices, lecture and classrooms, and exhibition studios. The basement is devoted to plant laboratory, storage, herbarium, and classrooms. This Studio has an attractive setting of gardens and lawn areas.

THE MEATS LABORATORY, built of brick, 74 by 112 feet, is fully equipped for the killing of cattle, sheep, and hogs, for the handling of carcasses, cuts, and by-products, and for the curing of meats. One section is devoted to the killing floor, refrigerators, and cutting room; the second is a pavilion into which may be taken the live animals to be slaughtered; the third, an amphitheater seating 500 people, is for use during short courses and special demonstrations.

JUDGING PAVILIONS AND BARNS, built of brick and thoroughly modern, are located adjacent to the main campus. Pavilions are available for classroom and laboratory work in livestock judging and management.

LIVESTOCK. The entire livestock equipment is available for instructional work which covers all phases of selection, breeding, feeding, management, and marketing of the various breeds and classes of farm animals, the killing of meat animals, and the cutting and curing of meats.

DAIRY CATTLE. Representative animals of each of the five major dairy breeds—Holstein, Jersey, Guernsey, Brown Swiss, and Ayrshire—are maintained at the Dairy Husbandry Farm a mile south of the campus. These animals are used for both instructional and experimental work. Records of the age, weight, period of gestation, feed consumption, milk production and net profit on all the animals on the Dairy Farm are kept for use in class instruction.

Despite the year around use of the dairy herd in classroom and experimental work it is producing in an excellent manner. Production records made by cows in each of the breeds rank among the best that have been made in Iowa and several have won national recognition. During the past year the entire herd of 80 milking cows produced, according to the records of the Cow Testing Association, an average yearly production of 405 pounds of butterfat per cow.

BEEF CATTLE. Representatives of three breeds of beef cattle are available as breeding stock and steers for instructional work in judging, feeding, and management. At the 1934 International Live Stock Exposition major winnings were grand champion steer, reserve grand champion steer, grand champion steer herd, champion get-of-sire all breeds competing, champion and reserve champion Aberdeen Angus steers, reserve champion Shorthorn steer, 7 firsts, 2 seconds, 2 thirds, 1 fourth, and 4 fifths. First prize on the get-of-sire, all breeds competing, has been won six times in eight years.

HOGS. Representatives of five breeds of hogs are maintained in the herd. At the 1935 International 24 ribbons were won on fat barrows which included 1 breed champion, 1 reserve champion, 4 firsts, 4 seconds, 7 thirds, 6 fourths, 2 fifths, and 1 sixth.

SHEEP. There are representatives of four mutton breeds and one fine wool breed. Their winnings at the International are evidence of the good type and quality of the flock. At the 1934 International Live Stock Exposition, in competition with many other colleges and breeders, prizes on sheep won were 3 reserve champions, 5 firsts, 5 seconds, 4 thirds, and 8 fourths. On wool the winnings were 5 firsts, 2 seconds, 2 thirds, and 2 fourths.

DRAFT HORSES. Representatives of three breeds are maintained. The Belgian stud is headed by the imported stallion Farceur de Grandglie. At the 1933 National Belgian Horse Show eleven head of Belgians were shown and won a total of 17 ribbons, which included 2 firsts, 2 seconds, and 3 thirds. The Percheron stud is headed by Carcellus and Carcitus, and include several mares that have won prizes at leading fairs. Several good representatives of the Clydesdale breed are also owned by the College.

THE POULTRY FARM. On this farm of thirty-six acres, most of the leading breeds and varieties of poultry are kept and bred for class purposes. The farm equipment includes many types of poultry houses. There are two laboratory buildings, one at the farm and the other on the campus. The four types of mammoth incubators and several types of small incubators offer exceptional facilities for major work in hatchery management. Ten large feeding batteries afford an excellent opportunity for carrying on tests in fattening market poultry. Houses and brooder equipment are provided for the rearing of 10,000 chicks and the maintenance of 3,000 layers and breeders. Several hens on the farm have production records of 300 eggs per year and above, and many are descendants of a White Leghorn hen which produced 1509 eggs in seven years.

AGRONOMY FARM AND EXPERIMENTAL FIELDS. The Agronomy Farm consists of 170 acres and is utilized entirely for field experiments in farm crops and soils, including the testing of varieties, the breeding of cereals and forage crops, studies of new crops, and the study of soil management problems with special reference to the use of manures, lime, and various fertilizers. Twenty acres near the campus are used exclusively for farm crops experiments.

THE AGRONOMY FARM LABORATORY AND SEED STORAGE BUILDING is a modern, two-story, brick and tile structure, used for drying and storing farm seeds, implement storage and grain breeding laboratories. Among the special features are corn drying rooms, seed cleaning equipment, and bins for small grains.

THE ANIMAL HUSBANDRY EXPERIMENTAL FARM of 182 acres is used exclusively for feeding and breeding experiments with beef cattle, hogs, and sheep.

THE DAIRY HUSBANDRY FARM. This farm, located about one mile south of the main campus, supplies a large part of the feed necessary for the dairy herd. Co-operative experimental work with pastures and other crops is also in progress at this farm.

The building equipment includes a dairy barn, calf barn, feed storage barn, horse barn, experimental barn, six-room farm house, milk house,

nine-room dormitory, judging pavilion, and silos. These are all modern in construction and design.

DIVISIONS OF AGRICULTURE AND ENGINEERING

THE AGRICULTURAL ENGINEERING LABORATORY consists of a one-story main building, a machine shed, and enclosed courtyard. It houses the offices, class and drawing rooms, shops and laboratories of the Department of Agricultural Engineering. This building, with almost 40,000 square feet of floor area contains excellent equipment in its shops and laboratories and provides all the facilities needed for both under-graduate and graduate instruction.

DIVISION OF ENGINEERING

ENGINEERING HALL is the heart of the group of laboratory and classroom buildings on the engineering campus. It is a four-story building of Bedford stone, housing the administrative headquarters of the division as well as the offices of the Civil, General, Mechanical Engineering, and Engineering Drawing Departments, and the Engineering Extension Service. In the building are numerous class and drafting rooms, a branch library and study room, and an assembly room with a seating capacity of 400. One portion of the building is fitted up as an instrument room for the surveying instruments employed in civil engineering instruction.

ENGINEERING ANNEX accommodates the Departments of Ceramic Engineering, Electrical Engineering, and Architectural Engineering. In addition to general offices, classrooms, and drafting rooms, there are four well equipped laboratories for dynamo electric machinery and one for telegraph, telephone, and radio equipment of the Electrical Engineering Department. The Architectural Engineering Department drafting and lecture rooms, their exhibits of designs, and their special facilities for graduate work are housed in this building.

A wing of the building is occupied by the Department of Ceramic Engineering with its laboratories consisting of clay working, kiln, pottery, and glaze rooms with ample equipment of modern design. One room in this wing is fitted up as a laboratory for the Mining Engineering Department. The entire top floor of the south wing of the building is given over to WOI, the college radio broadcasting station, with its studio and sending equipment. The station also uses space on the second floor as a receiving station for the United States Department of Agriculture crop and market reports which are received each day.

CHEMICAL ENGINEERING HALL. The present structure comprises about one-third of the building, which is planned eventually to provide for the Department of Chemical Engineering. A portion of the laboratory is two stories high to permit setting up heavy equipment required for research in the development of Iowa industries and the utilization of agricultural waste products. Two large laboratory rooms and several small ones are devoted exclusively to instruction in Chemical Engineering and all of the research equipment is available for instruction as needed.

THE INDUSTRIAL ARTS BUILDING contains offices and shops of the Industrial Arts Department, a freehand drawing room for the Architectural Engineers, and computing rooms for classes in engineering economics. The Engineering Experiment Station Laboratory occupies a wing of the building. It is equipped for carrying on experiments in sewage disposal, properties of materials and the strength of various engineering products made of metal, concrete, and ceramic products. Its main room contains testing machines with capacities as great as 300,000 pounds and a traveling crane for handling heavy experimental specimens. The basement is arranged for concrete and concrete materials research.

STEAM AND GAS LABORATORY. The laboratory work of the Mechanical Engineering Department is centered in this building. The main portion of the building is two stories high to accomodate a steam boiler with its overhead coal bunkers and other equipment, as well as various internal combustion engines. On the balcony and in the space around the central portion of the building are oil and gas analysis rooms, offices, class rooms, and report rooms. On the main floor are numerous prime movers for operation with steam or gasoline, air compressors, dynamometers, pumps, and a variety of small machines such as are encountered in modern power plant and factory installations.

Adjacent to the steam and gas laboratory is the shop group, consisting of four one-story brick buildings.

THE FORGE SHOP is a modern blacksmith shop, completely equipped with coal bunkers, stock rooms, and an exhaust fan system to keep the air reasonably clean. It also contains the equipment for arc and gas welding.

THE MACHINE SHOP with modern equipment of a wide variety provides facilities for that phase of mechanical engineering instruction.

THE FOUNDRY, adjoining the Steam and Gas Laboratory, contains the usual cupola and core oven and furnaces for melting brass and aluminum. It is equipped with a traveling crane and all of the small tools needed for instruction in modern foundry practice.

THE PATTERN SHOP with its wood working machinery and a fireproof pattern storage room, is just north of the foundry.

THE AERONAUTICAL LABORATORY, constructed as a temporary building during the World War for the training of mechanics for military service, has been rearranged so that part of it can be used for instruction in aeronautical engineering. The building is large enough to house the airplanes, airplane engines, and other equipment employed in class and laboratory work in aeronautical engineering. Portions of the building are used for demonstrations in connection with Engineering Extension Service short courses.

THE LABORATORY OF MECHANICS is the original engineering hall, built in 1883 and remodeled at various times in recent years. It contains laboratories and equipment for instruction in the properties of materials and in the theoretical hydraulics. It is equipped with testing machines of many kinds and much special apparatus for materials work. The road materials laboratory in this building has been recently expanded and modernized in accordance with the development of the highway field.

AGRICULTURAL BY-PRODUCTS LABORATORY. The Agricultural By-Products Laboratory was constructed by the Federal Government to house the Ames Field Station of the United States Deparment of Agriculture. In this building some 15,000 square feet of floor space are available for research in the field of the industrial utilization of agricultural by-products. The research program is conducted co-operatively by the Bureau of Chemistry and Soils of the United States Department of Agriculture and the Iowa Engineering Experiment Station.

DIVISION OF HOME ECONOMICS

HOME ECONOMICS HALL is an imposing three-story building of Bedford stone about 400 feet long, with adequate provisions for office space, laboratories, and classrooms for the eight departments which it houses. In addition, it contains an auditorium with a seating capacity of 700, a Fireplace Room used for social gatherings, a Seminar Room, and a Tea Room with a seating capacity of 100.

THE NURSERY SCHOOL AND ANNEX are located on an acre lot well planted in shade trees within a short distance of Home Economics Hall. There is ample space for outdoor play apparatus, gardens, and houses for pet animals. The main building is a low two-story brick structure especially equipped for children of from three to five years of age. The Annex is a frame residence equipped for the younger children.

THE HOME MANAGEMENT HOUSES, four in number, are frame buildings, each accommodating eight students, an infant, and a resident advisor. These are furnished for a family in modern circumstances and serve as laboratories for the course in home management.

DIVISION OF INDUSTRIAL SCIENCE

BOTANY HALL houses the offices, laboratories, and classrooms of the Department of Botany. There are eleven classrooms and laboratories devoted to teaching, eight laboratories to research, and two to sevice.

The botanical museum and herbarium are housed in the fireproof Annex. The museum and herbarium occupy one floor 58 feet wide and 51 feet long. The refrigeration laboratory in the basement consists of four rooms ranging from 40°F. above to 40°F. below. An adjoining laboratory is given over to grosser types of work, such as mills for grinding, apparatus for distilling water, and autoclaving soils.

Several experiment station laboratories are housed on the top floor of the Annex and the seed laboratory in one-half of the top floor of the main building. A part of the ground floor houses some of the work of the Department of Physical Education for Women.

CHEMISTRY HALL is a modern, well-equipped building, designed for research as well as class and laboratory teaching. It is a three-story brick structure with a usable basement, having a length of 244 feet, a width of 162 feet and a total floor space of 130,000 square feet. There are four wings, each 57 by 76 feet. These accomodate the large laboratories and some of the classrooms. The wings are connected by a central part 92 by 162 feet, in which are located the main offices, the storeroom system, many small laboratories and research rooms, and the

auditorium with a seating capacity of 300. The main ventilation system is supplemented by unit systems under fan control. This insures the forced ventilation of all laboratories and hoods and the elimination of fumes and disagreeable odors.

The arrangement of the laboratories, special and research rooms for advanced students, and offices is such that each floor is devoted to certain general classes of work. The storeroom system serves each floor independently, thus reducing stair climbing. The large laboratories, arranged to accommodate the maximum number of students, are located near the storeroom systems.

PHYSICS BUILDING. In the central structure, two stories in height, are grouped three lecture rooms and a preparation room. Adjacent to this and convenient to other classrooms and laboratories is a large apparatus room. There are four light courts, two on either side of the central structure. Extending entirely around the central group and the courts is a one-story structure containing the laboratories, classrooms, shops, and offices. The total floor area is more than 50,000 square feet, providing laboratory capacity for 1200 students.

Most of the laboratories and shops have concrete floors resting upon the ground, thus giving a solid foundation for experimental apparatus. Beneath the main corridor, which encircles the entire building, is a "service corridor" containing all service circuits. These circuits include electric lines, and gas, air, vacuum, and water pipes. Outlets are provided in all rooms, and by this means electricity, water, and gas are everywhere available.

The college instrument shop, which constructs and repairs scientific apparatus used in the entire college, is located in this building. A number of rooms in the northeast basement are occupied by the Department of Zoology and Entomology.

THE SCIENCE BUILDING is 49 by 114 feet with four stories and basement. The first and second floors and part of the basement are occupied by the Department of Bacteriology. The Department of Zoology and Entomology occupies the rest of the building. All student laboratories for microscopic work open to north windows, and in addition each student table is supplied with artificial light. The laboratories are well equipped with microscopes, models, mounted specimens, charts, constant temperature baths and cabinets, and other equipment and supplies needed for undergraduate and graduate instruction.

THE INSECTARY is a two-story fireproof building, 42 by 100 feet, connected with a greenhouse 20 by 115 feet, outdoor screened house laboratory 16 by 80 feet, and outdoor cellar for study of subterranean and hibernating insects. The greenhouse is divided into six compartments, each equipped with thermostatic temperature control. The main building contains small laboratories, a constant temperature room, and offices. Constant temperature and humidity chambers, water baths, and microscopes are available for research work. The building is unusually well equipped for life history, insecticidal, ecological, and physiological studies of insects. Adjacent land is available for plot experiments in insect control.

THE APIARY FARM of ten acres is located a short distance southwest

of the campus. The equipment includes laboratory and storage buildings, test plots for forage, student apiaries and the experimental apiary. The laboratory contains a model honey house and facilities for instruction. The test plots offer opportunity to study the availability of nectar and pollen for bees. Student apiaries are segregated and offer opportunity to study the various races of bees and types of equipment. The facilities are ample for advanced students to carry on research poblems.

THE ARMORY is a fireproof structure, constructed of tile and brick with heavy steel arches, gypsum ceiling and tile roof. It is considered one of the best equipped buildings for indoor military training to be found in the United States.

The drill floor is 170 by 210 feet. The building also contains a well equipped indoor rifle range and pistol range as well as storerooms for clothing and equipment, and a mechanic shop for the repair of motor vehicles and guns. Offices and classrooms for all military classes are also provided in the building.

THE MILITARY STABLES, of brick construction, are of the latest military type, suitable for about ninety horses and equal to any stables on a regular army post. These stables contain well equipped saddle rooms for riding equipment.

Within the stable area is also a horseshoeing shop and saddle shop, in addition to a lecture room, office, and quarters for the enlisted members of the Military Detachment.

A riding inclosure, 100 by 200 feet, giving ample room for equitation is located adjacent to the stables.

An excellent drill ground of about eight acres also adjoins the stable area. The whole set-up at the stables provides compact but ample facilities for all mounted instruction, including the equitation and mounted drill required for a Field Artillery Unit.

GYMNASIUM. This building, 297 by 83 feet, is one of the largest in America devoted to physical training. The main execise floor is 80 feet by 170 feet without obstructions of any kind, and is 24 feet high. It is equipped with standard apparatus of the latest design. The room is also equipped for basketball, indoor baseball, volley ball, and handball, and has a gallery running track 12 feet wide and 12 laps to the mile. The lower floor is of dirt and is used for general exercises, field and track work, and team practice. The building is equipped with a swimming pool 30 feet wide and 60 feet long; there are general and team locker rooms with all the necessary bath and toilet facilities. Below the stadium are six handball courts, wrestling rooms, and dressing rooms. In addition to the gynasium, the department has at its disposal an athletic field containing ten acres directly south of the gymnasium; a playground to the north of the gymnasium of about thirty acres; and the old athletic field containing about seven acres. These fields are fitted out for football, basketball, soccer, tennis, track, and field work. A tract of 150 acres adjacent to the Main Campus has been set aside as a recreational area and is in the process of development. A four mile bridle path, a polo field, a cross country course, an eighteen hole golf course, and facilities for canoeing are under construction.

MUSIC HALL, a brick building formerly known as "The Maples," an example of the usage of English domestic architecture of the Elizabethan period, is located in the south central part of the campus. It contains the studios and offices of the Music Department as well as practice rooms, a lecture room, and a room containing the practice clavier for study of carillon.

THE THEATRE WORKSHOP is a circular wooden building containing a studio 60 feet in diameter and 12 feet in height. It is used by the Department of Public Speaking as a workshop for the Iowa State Players, the student dramatic club, and as a laboratory for classes in play production.

The Workshop has a large area of unobstructed floor space, and is well adapted and equipped for the construction and painting of scenery, the construction of properties, the making of costumes, experimentation with stage lighting, and the rehearsal of plays in their settings. Occasional private performances are given in the Workshop, which provides ample space for a fair-sized stage and audience.

The Workshop houses all of the equipment of the Iowa State Players, which is thus available for demonstration in courses of play production.

DIVISION OF VETERINARY MEDICINE

The buildings of the Veterinary Division are arranged in a quadrangle surrounding an open court; the administration, hospital, and various departmental buildings are connected by corridors. The buildings are of brick and terra-cotta with climbing vines lending natural beauty to the architectural symmetry of the structures.

THE VETERINARY ADMINISTRATION BUILDING is the main building of the group. Here are located the Dean's offices, faculty room, offices of the departments of Medicine, Obstetrics, and Surgery, and an auditorium for assembly purposes.

THE VETERINRRY ANATOMY BUILDING contains laboratories, an amphitheatre classroom and well-lighted dissecting rooms with all the apparatus and exhibits necessary for the work.

THE VETERINARY HOSPITAL contains hospital stalls, kennels, etc., for the housing of the patients. Operating rooms, dispensary, clinic, and lecture rooms are all well lighted and adapted especially to the needs for which they were designed.

THE VETERINARY PATHOLOGY BUILDING comprises two offices, a laboratory for research work, a large classroom, and a large general laboratory in connection with which are pathology preparation rooms, sterilizing room, an incubating room and diagnostic laboratory.

THE VETERINARY PHYSIOLOGY AND PHARMACOLOGY BUILDING contains offices, modernly equipped laboratories, a large classroom, a private laboratory and dark room, experimental animal rooms, and various technical apparatus and exhibits.

THE CLINIC BUILDING. One wing of the new clinic building has been completed. This wing contains 35 stanchions and stalls for cattle. It is especially designed for work with cattle and will join directly with the operating rooms when the building is completed.

THE VETERINARY RESEARCH INSTITUTE consists of sixty acres devoted to research in animal diseases. In cases of emergency it may be used to produce biological products to control animal disease. New and very adequate buildings of brick construction are available for the various phases of research work.

THE COLLEGE LIBRARY

The College Library is designed primarily to serve the needs of the faculty and students of Iowa State College in their research and study. Its facilities, however, are available to all citizens of the state, who are at liberty to write or apply in person for any information which can be answered through the collection of the library. Books on scientific and technical subjects, in certain cases, may be borrowed by any citizen in the state, the borrower paying transportation both ways. Reference inquiries will be gladly answered, the advice of experts of the College being obtained when necessary.

The new building, opened for the use of the public in the spring of 1925, is designed to meet adequately the needs of both graduate and undergraduate students. A large reading room with over 300 seats and a shelf capacity of 18,000 volumes is on the second floor near the delivery desk and card catalog. On the first floor near the entrance are two rooms with a capacity of 150 seats each, one for newspapers and periodicals and the other for assigned reading.

For graduate students and faculty members, cubicles or small compartments with desks are provided in the stacks. Small private offices permit the use of typewriters and dictation without interference with other readers.

The library collection consists of about 240,000 selected volumes. A special attempt has been made to strengthen the library with sets of periodicals and society publications. The library is receiving currently over 5,000 periodicals and serials, principally in English, French, and German, although nearly every language is represented. The collections in the library adequately represent the specialized research work of the College.

REGULATIONS. The general library is primarily for free reference use; any student or citizen of the state may use the books in the reading rooms. The privilege of drawing books for use outside the building is available to all members of the instructing force, to all registered students, and to other accredited persons. Books not reserved may be borrowed for home use for two weeks and may be renewed for two weeks more if not specially restricted or called for. All books are subject to recall at any time.

General reference books, all general periodicals and certain other groups of books are to be consulted in the reading rooms only.

Books from the stacks which are not returned on time are subject to a fine of 2c a day before and 5c a day after notice has been sent out that the book is due. Books from the reserve shelves are subject to a fine of 25c for each hour kept overtime.

Books recalled for college work must be returned at once upon receipt of the notice. All books lost or damaged must be paid for.

HOURS OF OPENING. The general library is open Monday to Friday during the general sessions of college from 7:45 a. m. to 10:00 p. m., on Saturday from 7:45 a. m. to 6:00 p. m., and on Sunday from 2:00 to 6:00 p. m. During the Summer Session the library is open from 7:45 a. m. to 9.30 p. m., but is not open on Sunday. During vacation the library is open from 8:00 a. m. to 5:00 p. m., except on Saturday afternoons and Sundays.

The library is regularly closed on Thanksgiving and Christmas days.

PERSONNEL SERVICE

M. D. HELSER, Director of Personnel for Men
FRANCES A. SIMS, Director of Personnel for Women
WALLACE E. BARRON, Assistant Director of Personnel for Men

Divisional Personnel Officers: Agriculture, R. M. Vifquain; Engineering, L. O. Stewart; Home Economics, Dean Genevieve Fisher; Industrial Science, G. M. Fuller; Veterinary Medicine, Dean C. H. Stange

The Personnel Service was organized at Iowa State College as a service department for the benefit of the students, the alumni, the faculty, and all organizations and individuals interested in employing either students or alumni. The personnel officers endeavor to serve the students and alumni as indicated below.

I. STUDENTS.

A. RECORDS. Complete information is secured from each entering student concerning his family, high school record, and practical experiences. Five references, including personality ratings from high school teachers and family friends, are required. A psychological examination is given by the Psychology Department. This information is assembled on the personnel record card and given to the student's counselor.

During his residence in college complete and detailed information concerning the student is added to his preliminary material. The final record thus contains a composite of the student's personality ratings, and all other useful personnel information.

B. COLLEGE ADJUSTMENT. Twenty-two counselors have been appointed from the faculties of the various divisions to advise freshmen and sophomore students. On entering college each student is assigned to one of these counselors, who, under the direction of the Dean of the Junior College, will aid him in making his adjustment to college life. When the student enters the junior year he is assigned to a senior college counselor who is a member of the department in which the student expects to do major work.

A student failing to make the scholastic average expected of him is interviewed by one of the personnel directors and the head of the department in which he is majoring. Methods of improvement are suggested and the student's later progess is carefully followed.

C. OCCUPATIONAL INFORMATION. Staff members assist the counselors and personnel officers in furnishing information concerning the various vocations. An attempt is made to assist the student in choosing a vocation to which he is adapted.

D. PERSONAL DEVELOPMENT. One of the chief functions of the department is to assist the student in the improvement of his personality. Every personnel officer is ready to help the student in developing those traits of character that will not only create a favorable impression but also contribute to his usefulness in later life.

E. EMPLOYMENT. This Service co-operates with other agencies in making every effort to assist students in finding part-time employment.

A very important phase of the work of the personnel office is the assistance to seniors in securing proper employment upon graduation. Information on file regarding industrial concerns employing seniors after graduation assists greatly in the proper placement of seniors.

F. RESEARCH AND TEACHING. Special personnel studies are conducted from time to time by the personnel officers. Courses in personality development and personnel administration are taught by the College.

II. ALUMNI. The personnel officers assist the alumni of Iowa State College by supplying information concerning positions available. Any alumnus interested in securing employment or in changing his position may write to the personnel service for assistance. A special effort is made to keep in touch with the alumni and assist them in every way possible.

STUDENT HEALTH SERVICE

JAMES F. EDWARDS, M. D. Director
Assistants, Dr. Sara B. Kalar, Dr. A. N. Schanche, Dr. J. G. Grant, Fern A. Goulding, R.N.

The college recognizes that the development of the body and the establishment of good health standards should go hand in hand with the development and training of the mind. To this end it has established the Student Health Service in the department of Hygiene, whose chief functions may be outlined as follows:

1. HEALTH EXAMINATION of all students in order that the health status of each one may be determined and that advice and remedial measures may be applied, for the purpose of enabling the students to receive the greatest benefit both during their college years and in after life.

All new students are required to fill out a health history statement sent to them by the registrar and, upon admission, are given an examination by the medical staff.

This is followed each subsequent year by additional examinations. Before registering in a higher class and before graduation, each student is required to have on file in the Registrar's Office, a statement from the Health Service that such examination has been made. Students will present themselves at the Hospital for this periodic examination when notified; seniors during the Fall Quarter, juniors during the Winter Quarter, sophomores during the Spring Quarter, graduate students during the Winter Quarter.

Through these examinations and the following up with advice, instruction and treatment of those students showing physical defects or health impairments, the Health Service is able to keep many students in school

with improved health conditions, who otherwise would fail to get the most out of their college course.

The close co-operation between the student health service and the departments of physical education makes it possible to correct many physical defects by prescribing proper exercise and to prevent the possible ill effects of too strenuous exercise for such as need carefully supervised physical training.

II. HEALTH INSTRUCTION. In addition to scheduled work outlined in courses of instruction under the Hygiene Department in this catalogue, the health service utilizes its many contacts with students to emphasize the importance of good health and to help them in solving their individual health problems.

III. MEDICAL AND SURGICAL SERVICE in cases of sickness or injury. In order to furnish complete medical care and advice for sick students as promptly and conveniently as possible, the college has provided a well equipped modern hospital and dispensary needed both for the care of students with conditions requiring hospital service and for attention to the lesser ailments that can be cared for in the dispensary without hospitalization.

All students who pay the full registration fee are insured medical and routine nursing service by the college medical and nursing staff in case they come to the hospital or dispensary. Medicines and service such as x-ray may be supplied on a cost basis.

The following regulations apply to the privileges of the hospital.

1. Students entering the hospital will be given three days' service without charge. For all time in excess of three days per college year, the student is charged at the rate of $2.00 a day to cover board, room, light and heat. Faculty and other college employes or members of their families may be admitted, at the discretion of the college physician, at cost of hospitalization.

2. In case a special nurse or physician is employed, the expense shall be borne by the particular patient, the selection of such a nurse or physician to be approved by the college physicians.

IV. SANITATION OF STUDENTS' ENVIRONMENT. The sanitary conditions surrounding the college are excellent. They are supervised by the Public Health committee of the Faculty co-operating with the Department of Hygiene.

The college has its own excellent water supply. The college buildings, students' quarters and surroundings are kept under sanitary surveillance.

V. PREVENTION OF INFECTIOUS DISEASES. An important part of the work of the Health Service is the prevention of epidemic diseases.

All such cases are isolated and contacts with them are kept under such supervision as may be required in accordance with modern epidemiological methods.

The President and the college physician may require of students entering the College a certificate from a reputable physician showing successful vaccination. It is strongly urged that all students entering Iowa State College be vaccinated before leaving home. This is recommended in order that valuable time may not be lost during the college year by the necessity of being vaccinated.

The college physicians are authorized to exclude from the dormitories and recitation rooms any persons afflicted with a contagious disease, and in case of necessity, contacts with such cases.

RELIGIOUS LIFE AT THE COLLEGE

RELIGIOUS SERVICES are held about once each month on Sunday nights and are addressed by prominent clergymen and other religious speakers. An attractive feature of these services is the music by a large chorus choir and by other musical organizations on the campus. During the summer session vesper services are held each Sunday.

RELIGIOUS EMPHASIS WEEK is set apart each year in January. Discussions are carried on in dormitories and organized houses. A speaker of national reputation is secured for a convocation address and to speak on other occasions to faculty and student groups. The final service is held on Sunday night with all church groups co-operating.

THE CESSNA LECTURES have been established as a means of perpetuating the spirit and ideals of Dr O. H. Cessna, a graduate in the Class of 1872 and Professor and College Chaplain from 1900 to the time of his death in 1932. The general theme of the lectures is Philosophy and Religion.

THE STANTON MEMORIAL CARILLON is very much at the heart of the College religious life. Great hymns of the church are played each morning during the fifteen minutes preceding the opening of classes. For many, this period becomes a time of meditation and devotion.

YOUNG MEN'S AND YOUNG WOMEN'S CHRISTIAN ASSOCIATIONS. These two organizations are quartered in Alumni Hall on the campus, where parlors, reading rooms, game rooms, service counter, etc., are provided. The room and employment service for men is handled through the Y. M. C. A. Both associations carry on a varied and vigorous program of religious group meetings, discussion groups in houses where students room, and many other activities tending to build up the moral and spiritual life of students. Special emphasis is given to freshman work. The purpose is not only training for future leadership in religious work but the larger one of challenging potential possibilities in every freshman. The two associations are rated as among the leading organizations of this kind in the United States.

COLLEGE PASTORS AND CHURCH WORK. All Ames pastors and churches maintain special work for students. There are ten denominations represented and students find an unusual opportunity for worship, participation in church school, young people's work, religious dramatics, recreational and social life, and other forms of religious effort. Five denominations have developed special plants and equipment adjacent to the campus to care for this work.

DIRECTOR OF RELIGIOUS LIFE. Through this office the College maintains a direct touch with the work that is being carried on through the religious organizations. Courses in Religious Education are also provided and much time is spent in personal conferences and in the correlation and direction of religious activities in such a way as to be helpful to the entire faculty and student body.

FRATERNITIES AND SORORITIES

A number of fraternities and sororities have established chapters at Iowa State College with the approval of the college authorities. These groups are subject to rules which have been worked out jointly by these organizations and the faculty. They co-operate with the college in the improvement of scholarship, in the molding of character, and in the all-around development of their members.

Pledges may be formally initiated after two quarters of attendance during which they have earned at least twenty-eight quarter credits with an average standing of not less than one and one-half quality points per credit.

The nine national sororities provide accomodations for approximately 250 women. All freshman women are required to live in the dormitories for one year. The average cost of living in a sorority house is $45 a month for each member. This amount pays for board and room, chapter dues, and social obligations. The average initiation fee is $50.

The thirty-two social fraternities provide homelike surroundingss and wholesome food for approximately 900 men. First year students who are invited to join may live in fraternity houses. During the past school year, the monthly expenses of members varied from $30 to $45, which included board and room, dues, and social functions. The initiation fee varies from $15 to $60.

ART ACTIVITIES

The Committee on Art serves as a consulting body concerning artistic affairs in the institution, and aims to create an environment in which students come to value art. Prominent among the activities of this committee are the selection, framing and hanging of pictures, both originals and reproductions, in the college buildings; statuary of merit is also acquired occasionally.

From time to time the Memorial Union, various departments, and interested student groups arrange for loan exhibits of works of art. Exhibitions sent out by the Iowa Artist Club, the Iowa Art Salon, and the Iowa Art Guild are regularly displayed in the Memorial Union. The directors of the Memorial Union Corporation annually arrange the Iowa Artists Dinner in honor of those whose work, coming from the Iowa Art Salon, is displayed in the Great Hall.

President Hughes, with the assistance of the committee, was instrumental in securing for the College the mural paintings in the college library, executed under the direction of Grant Wood, as well as the sculptures of Christian Petersen in the Dairy Industry Building and its court. These works were done as part of the Public Works of Art Project.

LECTURES AND ENTERTAINMENTS

The College offers a wide variety of musical and dramatic entertainments, and lectures by men and women of recognized authority. The rendition of Handel's "Messiah" is an annual event of special interest.

The Artists' Course for 1935-1936 includes such attractions as the Don Cossack Chorus and the Minneapolis Symphony Orchestra. Important lectures are those by Frances Perkins, Thornton Wilder, and Father Hubbard.

DEBATING

The chief aim of debating at Iowa State College is to give students instruction and practice in public discussion. Under the direction of the Department of Public Speaking, the members of the debate squad each year participate in both intercollegiate and intra-mural debates upon questions of public interest. Iowa State College has a chapter of Delta Sigma Rho, national honorary forsenic society, and an active local debate organization.

THE IOWA STATE PLAYERS

The Iowa State Players is the college dramatic club, sponsored by the Department of Public Speaking and directed by members of its staff. Each year the Players produce several full-length and one-act plays. These productions offer to students the opportunity to take part in the production of good plays, and to the college community as a whole the opportunity to see good plays. Some notable past productions have been: *Hell Bent for Heaven,* Moliere's *The Miser, Mr. Pim Passes By, The White-headed Boy, Outward Bound, Wings Over Europe, The Cradle Song,* and *The Bat.*

STUDENT PUBLICATIONS

The Iowa State Student is a tri-weekly newspaper published by a staff appointed from the student body. It is devoted to the news of the College.

The Iowa Agriculturist is an agricultural monthly magazine published by the students of the Agricultural Division, in co-operation with the Department of Technical Journalism.

The Iowa Engineer is published monthly by the students of the Engineering Division.

The Iowa Homemaker is a home magazine published monthly by the students of the Home Economics Division.

The Bomb is an all-college annual published by the students.

The Green Gander is a college humor quarterly published by Sigma Delta Chi and Theta Sigma Phi, student journalism societies.

The Ames Forester is an annual published by the Forestry Club.

Sketch is a literary magazine published once a quarter by undergraduate students interested in creative writing, with the co-operation of the Department of English.

Horizons is a quarterly magazine published by students of the Landscape Architecture Department.

These student publications are published at the College by The Collegiate Press, Inc., a printing plant owned by the publications.

ALUMNI ASSOCIATION

The Alumni Association of the Iowa State College was organized in 1876. Its purpose is to promote the highest interests of the institution and to increase friendship and sympathy among students and alumni.

The present officers of the association are:
President, Charles T. Cownie, '26, Des Moines, Iowa.
Vice-President, R. M. Evans, '13, Laurens, Iowa.
Recording Secretary, Nell (Whittemore) Wallace, '22, Ames, Iowa.
Treasurer, C. B. Murray, Ames, Iowa.
General Secretary, Harold E. Pride, '17, Ames, Iowa.

The annual meeting and banquet are held commencement week.

Active local branches of the general association exist in all the principal cities of the United States and various counties in Iowa.

The ALUMNUS the official organ of the association, appears monthly throughout the year. It is under the supervision of the general secretary.

The offices of the association are on the second floor of Memorial Union. Here all Iowa State men and women will find a hearty welcome.

Admission to College

(For admission to the Graduate College, see page 75.)
(For admission to Non-Collegiate Curricula, see page 286.)

Each student entering college must be at least sixteen years of age, must make formal application for admission, and must present a certificate signed by the superintendent or principal specifying the branches of study and credits included within his high school course of study. The application for admission and the official high school transcript from each school attended should be filed with the Registrar at the close of the school year, if possible, and not later than the first Monday in September, December, or March. The Registrar will evaluate all credentials and will notify the applicant of their acceptance.

Applicants should write to the Registrar for the application for admission, for high school certificate forms, and for general information concerning admission. If the applicant has attended more than one high school, he should ask for a high school certificate blank for each school attended. Principals of Iowa high schools have a supply of these certificate blanks in their offices.

All credentials which are accepted toward admission to the college must remain permanently in the files of the Registrar.

In general, students may enter the Divisions of Agriculture, Engineering, Home Economics, and Industrial Science at the beginning of any quarter. Regular classes begin in September, and students are urged to enter at that time. Some freshman subjects are, however, begun in each quarter. Those who wish to come at the beginning of the Winter or Spring Quarter should inquire from the Registrar whether entrance at that time is feasible in their cases. Admission to the Division of Veterinary medicine is granted only at the beginning of the Fall Quarter.

Thorough preparation is important, particularly in subjects which are to be continued in college. Since satisfactory progress is impossible without a good foundation, students are urged to review carefully, before entering college, algebra through quadratics, and English composition and grammar.

DEFINITION OF A UNIT. The requirements for admission are stated in terms of units. A unit is defined as the equivalent of one high school subject satisfactorily pursued during one school year, at least thirty-six weeks in length, on the basis of five recitations a week, the course of study for which the student is registered requiring no more than four subjects or twenty recitation periods a week. The length of the recitation period shall be at least forty minutes. A unit is equivalent to two high school credits.

GRADUATES OF IOWA HIGH SCHOOLS. A graduate of a public four-year high school in Iowa who presents fifteen units of work will be admitted

without examination to such collegiate work as he is prepared to pursue. A graduate of any private four-year high school, seminary, or academy approved by the Board on Secondary School Relations will be admitted on the same basis.

GRADUATES OF HIGH SCHOOLS IN OTHER STATES. Graduates of high schools accredited by the state universities, or by other state accrediting agencies in case there is no state uninversity accrediting agency, will be admitted by certificate. High school graduates whose certificates would be accepted without examination by reputable colleges in the state in which they are located, provided these states have no accrediting system, will be admitted by certificate. Graduates of other schools will be required to take entrance examinations. The high school records of non-residents of the State of Iowa must average at least half-way between "C" and "D" on a four-letter marking system with "A" as the highest mark and "D" as the lowest passing mark. Applicants whose records do not meet this requirement will not be admitted.

GRADUATES OF NON-ACCREDITED HIGH SCHOOLS. A graduate of a private Iowa secondary school not approved by the Board on Secondary School Relations or of an unaccredited high school outside of Iowa may be admitted to a collegiate curriculum by the following plan.

(a) He must pass entrance examinations in subjects representing each of the main groups of subjects certified, for one-third of the number of acceptable units so certified.
(b) The subjects for examination are to be selected by the examiner irrespective of the choice of the student at the time of the examination.
(c) The total number of units allowed on the certificate shall not exceed three times the number earned by examination.
(d) The total amount of credit gained by examination and certificate must at least equal the requirements for admission as stated on page 41.

NON-GRADUATES OF HIGH SCHOOLS. A student who is not a graduate of an Iowa public four-year high school or a private four-year high school, academy, or seminary approved by the Board on Secondary School Relations, or a graduate of an accredited high school outside of Iowa, will not be admitted unless he presents at least fourteen acceptable units by certificate, by examination, or both certificate and examination. He will be conditioned to the extent of enough units to bring the total to fifteen. These units must be distributed according to the specified list of units found on page 41.

GRADUATES OF VOCATIONAL AGRICULTURAL HIGH SCHOOLS. For students entering the Division of Agriculture from courses in vocational agriculture as organized under the Smith-Hughes Vocational Education Law, the entrance requirements will be modified by permitting the applicant to offer subjects in vocational agriculture for one-half of the required entrance units. The work is to be accepted only when taken in an accredited vocational agricultural high school under instructors who are four-year agricultural graduates trained for teaching. For these students the following requirements shall remain the same, namely: English, 3 units; History-Civics-Economics, 1½ units; Algebra, 1 unit;

Plane Geometry, 1 unit; and the remaining units to complete one-half of the required units shall be in the first five groups mentioned on page 41.

For these same students, the following electives are added, which, if taken, must be counted as a part of the units assigned to vocational agriculture: Industrial History, ½ unit; Rural Sociology, ½ unit; Rural Economics, ½ unit; Farm Accounting, ½ unit; and Farm Arithmetic, ½ unit.

CREDITS FROM ACADEMIES AND PREPARATORY SCHOOLS. Credits certified from private secondary schools such as academies and seminaries, and from college preparatory schools will be estimated in accordance with the definition of the entrance unit and on the basis of four years of preparation and residence. College academies or preparatory departments conforming in their organization to the organization of the four-year accredited high school will be treated as accredited schools if the colleges themselves are regarded as standard colleges.

CREDITS BASED UPON TEACHERS' CERTIFICATES. Entrance units may be granted upon the basis of a First Grade Uniform County Certificate for subjects marked 85% or above, as follows. Arithmetic, ½ unit; United States History, ½ unit; Physiology, ½ unit; Grammar, ½ unit; Civics, ½ unit; Economics, ½ unit; Algebra, 1 unit; Agriculture, ½ unit; Domestic Science, ½ unit; Manual Training, ½ unit; and for State Certificates when gained by examination, as follows: Second Grade, 10½ units; First Grade, 14 units; Life Diploma, 16 units.

COLLEGE ENTRANCE EXAMINATIONS. Students who desire to enter by examination and who present satisfactory evidence that they have made sufficient preparation will be examined in any subject required for entrance as outlined on page 41.

Entrance examinations will be given at the beginning of every quarter. See examination schedule on page 44

Certificates of entrance examinations passed for admission to reputable universities and colleges, and certificates of examination passed under the direction of any of the College Entrance Examination Boards or the Regents of the State of New York, will be accepted on the same basis as the certificates from the accredited schools of Iowa.

ADVANCED STANDING. Work of recognized merit which has been taken in colleges and universities of good standing will be credited for an equivalent amount of work in so far as it applies on any curriculum offered in this College.

College credits accepted from other colleges must average "C" on a four-letter marking system with "A" as the highest mark and "D" as the lowest passing mark. Non-residents of the State of Iowa will be denied admission unless their college credits average "C". For residents of the State of Iowa, courses marked "D" or an equivalent amount of credit in other courses will be rejected if necessary in order to bring the accepted credits to a "C" average. Such rejected credits may be "recovered" if the student makes a sufficiently high scholastic record in this College. Iowa residents whose averages are below "C" will be admitted on scholastic "probation."

At least one month prior to the opening of the quarter, each applicant should send to the Registrar an official transcript from each institution attended to ascertain the credit to be allowed. Such credits will be provisionally accepted. The final acceptance of the credits will depend upon the student's maintaining a satisfactory standing for one year.

Prospective students will be required to present a letter of honorable dismissal from the institution last attended, to file a formal application for admission, and to present an official transcript from each high school attended.

High school credit in excess of sixteen units may be converted into college credits only in case the student is able to pass a rigorous examination for college credit in a subject corresponding to the work of his curriculum.

College Graduates Who Desire Baccalaureate Degrees. A graduate of any college of approved standing may be granted the degree of Bachelor of Science in any curriculum offered by the Division of Agriculture, Engineering, Home Economics, or Industrial Science, upon the completion of 108 quarter credits in residence, or, in special cases, upon the completion of such number of credits as may be fixed by the Committee on Advanced Standing.

The student must take all the required technical courses taught by the department in which he is classified and such other technical and non-technical courses as shall be specified by the head of the department and the dean of the division to a total of 108 quarter credits. This does not abrogate the rule that all specified prerequisites or their equivalents shall be met as determined by the Committee on Advanced Standing.

Co-operative Programs Leading to Two Degrees. The College has co-operative agreements with other colleges and universities whereby a student may graduate from both institutions upon the completion of five years of work. Under this plan the student transfers to Iowa State College after having completed three years of study elsewhere.

Before transferring to Iowa State College a student must complete at least three years of work, securing thereby 135 or more quarter credits, 60 of which must be in science departments.

Such a student may then enter this College as a junior in the Division of Agriculture, Engineering, Home Economics, or Industrial Science and graduate from one of the various curricula offered in these divisions in approximately two years upon the completion of 108 quarter credits, or in special cases, upon the completion of a greater or smaller number of credits.

In all cases a student must take the technical courses required for the major work in which he is classified, and such additional technical and general work as may be required in the curriculum elected, but the maximum requirement usually will not exceed 108 quarter credits.

Any student who has decided to take the five-year curriculum under the co-operative plan, or who wishes further information concerning it, should write to the Registrar two years before transferring, or preferably at the time of entering college.

A plan has also been provided whereby students who complete the first three years in the curriculum in Industrial Science and subsequently complete the first year in a medical curriculum in a Class A medical

college or the first year in a law curriculum in a recognized law college will be awarded the degree of Bachelor of Science from Iowa State College. By this arrangement the student can reduce to a minimum the time required to earn a Bachelor of Science degree from this College and a degree in medicine or law from another institution.

A similar plan provides for granting the degree of Bachelor of Science at the end of three years of residence in the Engineering Division of this College followed by one year of law in a recognized law college.

SPECIAL STUDENTS. To be classified as a Special Student in any of the college curricula one must be at least twenty-one years of age, must give good reasons for desiring such classification, and must furnish satisfactory evidence that he is thoroughly prepared to pursue the work chosen. Permission to take a special course and the subjects included therein must be secured from the Head of the Department in which the student seeks enrollment, the Dean of the Division, and the President of the College.

Permission to take a special course will not be granted to students until they have completed the freshman year of one of the curricula offered, and then only for a period not to exceed one year. Exceptions to the regulations requiring the completion of the freshman year, and to the rule limiting the special course to two years, including the freshman year, will be made in cases of persons of mature years who desire to take a particular line of scientific or technical work, and whose application to take such course is approved by the Dean of the Division in which the student seeks enrollment and by the President of the College.

The standard prerequisites for advanced work are subject to limited modifications with the approval of the Dean of the Division in which the student is classified.

GRADUATES OF APPROVED COLLEGES who are not candidates for a degree may take special work under the rules governing special students without having to complete the freshman year in any of the college curricula. Classifications of such Special Students must bear the approval of the Head of the Department in which the student is registered, the Dean of the Division, and the President of the College.

IRREGULAR STUDENTS. Worthy students in good standing, over twenty-one years of age, not prepared to meet the entrance requirements of the freshman year, may be admitted without examination as Irregular Students, and may pursue college work not to exceed two years, provided:

1. That they give evidence of satisfactory preparation to carry such work successfully.

2. That they show good and sufficient reasons for not taking a regular course.

3. That they present a certificate covering their entire preliminary education.

4. That before registering as Irregular Students they obtain written permission from the Dean of the Division in which their major subjects are to be taken and from the President of the College. Such students will then be registered and classified the same as regular college students and will be subject to the same college rules.

ENTRANCE REQUIREMENTS BY DIVISIONS

	Division of Agriculture Units	Division of Engineering Units	Division of Home Economics Units	Division of Industrial Science Units	**Pre-Veterinary Year Units
*Groups—					
1 English	3	3	3	3	3
2 Foreign Language†	0	0	0	0	0
3 Social Science	1½	1½	1½	1½	1½
4 Mathematics					
Algebra ‡	1	1½	1	1½	1
Geometry, plane	1 } 2	1 } 2½	1 } 2	1 } 2½	1 } 2
5 Natural Science	0	0	0	0	0
Additional requirements in the above groups 1, 2, 3, 4, and 5	4½	4	4½	4	4½
Minimum total	11	11	11	11	11
6 Miscellaneous	4	4	4	4	4
Total units required for admission	15	15	15	15	15

*For subjects included within Groups, see below.
**For requirements of the Pre-Veterinary Year, see page 262.
†Each high school student is urged to complete two units in one foreign language.
‡Dairy Industry and Chemistry, Dairy Industry and Economics, Forestry, and Landscape Architecture require 1½ units of algebra.

SUBJECTS REQUIRED OR ACCEPTED FOR ADMISSION

The following is a list of subjects which will be accepted as prerequisite to the collegiate curricula and the number of units which will be accepted in each.

Not less than a minimum nor more than the maximum indicated below will be accepted as a part of the 11 required units.

Group 1. ENGLISH.

Three units required; not more than four accepted. The required units must be selected from composition and rhetoric, literature, and English grammar. No credit will be given for grammar if taken before the eleventh grade. Any of the following credits will be accepted in addition to the three required units, provided the total amount offered does not exceed four units.

English	½ to 1 unit
Public Speaking	½ unit
Business English	½ unit
Grammar	½ unit
Journalism	½ unit

Group 2. Foreign Languages.

A total of not more than 4 units will be accepted in any one foreign language. No credit will be given for less than one unit in any foreign language.

(a) Greek	1 to 4 units
(b) Latin	1 to 4 units
(c) French	1 to 4 units
(d) Spanish	1 to 4 units
(e) German	1 to 4 units
(f) Scandinavian	1 to 4 units

Group 3. Social Science.

A total of not more than 4 units, including the required 1½ units, will be accepted. No credit will be given for United States history if taken before the eleventh grade.

(a) Ancient History	½ to 1 unit
(b) Medieval and Modern History	½ to 1 unit
(c) English History	½ to 1 unit
(d) United States History	½ to 1 unit
(e) General History (but not in addition to Ancient, Medieval, and Modern History)	½ to 1 unit
(f) Civics (may include American Citizenship, ½ unit, and Community Civics, ½ unit)	½ to 1 unit
(g) Economics	½ unit
(h) Sociology	½ unit
(i) Citizenship	½ unit
(j) Community Civics	½ unit

Group 4. Mathematics.

(a) Algebra	1½ units
(b) Plane Geometry	1 unit
(c) Solid Geometry	½ unit
(d) Plane Trigonometry	½ unit
(e) Advanced Algebra (if taken in fourth year of high school course)	½ unit

Group 5. Natural Science.

A total of not more than 4½ units will be accepted in this group.

(a) Agriculture	½ to 2 units
(b) Astronomy	½ unit
(c) Biology, elementary	½ to 1 unit
(d) Botany	½ to 1 unit
(e) Chemistry, no credit given for less than	1 unit
(f) General Science	½ to 1 unit
(g) Geology	½ unit
(h) Physical Geography or Physiography	½ to 1 unit
(i) Physics, no credit given for less than	1 unit
(j) Physiology	½ unit
(k) Zoology	½ to 1 unit

Group 6. MISCELLANEOUS. Whatever work to the extent of four additional units the school certifies as accepted by that school for graduation may be credited in this group. Any subject such as physical training, music, glee club, band, etc., which is permitted in addition to four regular high school subjects is considered an "extra curricular subject." In special cases, credit to the amount of not more than ½ unit per year in such extra-curricular subjects may be used toward admission if they were counted toward high school graduation.

The following subjects are frequently presented in this group:

(1) Commercial subjects.

(a) Arithmetic (not in addition to Advanced Arithmetic, and only if taken in the latter half of the high school course)	½ unit
(b) Elementary Bookkeeping	½ to 1 unit
(c) Advanced Bookkeeping	½ to 1 unit
(d) Business Organization	½ unit
(e) Commercial Geography	½ unit
(f) Commercial Law	½ unit
(g) Economic History of England	½ unit
(h) Economic History of United States	½ unit
(i) Salesmanship	½ unit
(j) Stenography	½ to 2 units
(k) Typewriting	½ to 2 units
(l) Vocational Guidance	½ unit

(2) Industrial Subjects

(a) Freehand or Mechanical Drawing
(b) Manual Training, i.e., Shop Work
(c) Home Economics

(3) Miscellaneous.

(a) Bible	½ to 1 unit
(b) Music (only when taken as a full subject with daily class periods, with the usual periods of study) may include Musical History, ½ unit	½ to 2 units
(c) Agriculture—additional units	½ to 2 units
(d) Psychology	½ to 1 unit
(e) Pedagogy and Methods	½ to 1 unit

REMOVAL OF ENTRANCE CONDITIONS. A student who is admitted with deficiencies must remove them by passing entrance examinations or by taking courses at the College. Credit earned in removing such deficiencies will not be allowed toward graduation.

Entrance conditions in specific subjects must be removed by registering for these subjects at the earliest opportunity. Such deficiencies must be removed before the student registers for his second year's work. Entrance conditions in elective subjects may be removed by taking extra college work before graduation. College courses so used will be credited toward admission at the rate of nine quarter credits as the equivalent of one high school unit

A student admitted with conditions will not be permitted to remove

these conditions by taking extrance examinations in subjects in which he has been taking college courses for credit.

If a student presenting the required entrance credit in a given subject fails to do satisfactory work in the succeeding college course he may be assigned to a review course. Such work will not be counted toward his degree.

ENTRANCE EXAMINATION SCHEDULE. Admission to the entrance examination is by permit which may be obtained from the Assistant Examiner, Room 105, Central Building.

The examinations will be given on September 17, 1936, January 2, 1937, and March 22, 1937, at the following hours.

8 A. M. to 10 A. M.	10 A. M. to 12 M.
Algebra	English
Plane Geometry	History, American
Solid Geometry	History, English
Physics	Civics
Physiology	Economics
Botany	Sociology
Physiography	

Any student finding a conflict in his program or requiring other entrance examinations should report to the Assistant Examiner for adjustment.

FRESHMAN DAYS

Ten years ago Iowa State College set aside a short period prior to the opening of the regular college year and designated it as "Freshman Days." These days are for the beginning student and serve a threefold purpose: *First*, to provide an opportunity to induct the new student into the educational life of the College; *second*, to provide a time when certain tests may be given—the purpose of these tests being to furnish to those who are in charge of the counseling and guidance program of the institution such information as will be helpful in planning the student's program; and *third*, to provide time to register each student in the curriculum he has chosen.

All new undergraduate students, whether entering with advanced standing from other colleges or direct from high school, are urged to be present and share in the program provided. Nothing should be allowed to interfere with the activities of these days. They start Thursday, September 17, 1:00 P.M., with the opening meeting in the State Gymnasium, and will continue to the following Monday night. President R. M. Hughes will give the opening address after which students will be organized into small groups under faculty leaders.

HEADQUARTERS: "Freshman Days" headquarters will be maintained in Room 3, Central Building.

INVITATION TO PARENTS: Parents of new students are cordially invited to visit the campus during "Freshman Days." They are particularly urged to attend the opening meeting at 1.00 P.M. on Thursday, September 17, in the State Gymnasium, and the reception later the same after-

noon for parents and students in Great Hall, Memorial Union. At the reception parents will have opportunity to meet the counselors and teachers of new students.

Fees and Expenses

(Fees are subject to change without notice)

FEES

PAYMENT OF FEES: All fees must be paid on registration day at the beginning of each quarter.

MATRICULATION FEE: Every student upon entering the college must pay a matriculation fee of $10.00. Exception is made in case of all non-collegiate students. This fee is paid but once.

REGISTRATION FEE FOR UNDERGRADUATES. The registration fee for undergraduates, indicated below, covers the following fixed charges: laboratory fees, hospital service, use of library, membership in the Memorial Union, and incidentals; the fee also entitles the student to admission to athletic contests, concerts, lectures and debates, to subscription to the several student publications, and covers class dues of twenty-five cents a quarter.

	Fall	Winter	Spring
Division of Agriculture	$30.00	$30.00	$30.00
Department of Agricultural Engineering	35.00	35,00	34.00
Division of Engineering	40.00	39.00	39.00
Division of Home Economics	36.00	36.00	36.00
Division of Industrial Science	36.00	36.00	36.00
Division of Veterinary Medicine	40.00	39.00	39.00

Non-residents of the state, excepting those in Graduate College, must pay tuition in addition to the registration fee.

Irregular, Special, and Non-Collegiate Students pay the same registration fee as other students in the division in which they are enrolled.

REGISTRATION FEE FOR GRADUATE STUDENTS. The registration fee for graduate students covers the following fixed charges: laboratory fees, hospital service, use of library, membership in the Memorial Union, and incidentals.

	Fall	Winter	Spring
Graduate College	$32.00	$32.00	$32.00
Graduate College, staff members	12.00	12.00	12.00

By paying $4.00 in addition to the above registration fee each quarter, graduate students will be entitled to admission to athletic contests, concerts, lectures and debates, and to subscripion to the several student publications.

For Summer Session fees, see page 298.

TUITION: In addition to the Registration Fee, all students who are non-residents of Iowa, except those in the Graduate College, will be charged tuition as follows:

Fall Quarter	$14.00
Winter and Spring Quarters, each	13.00
Each Term of the Summer Quarter	7.00

Non-resident tuition will not be charged to students who have been residents of Iowa six months previous to their admission.

Students who return to college at the close of a regular vacation will not be considered to have changed their legal residence from the standpoint of assessment of non-resident tuition. But a student who remains out of college six months or more and gains a legal residence in Iowa will not be required to pay tuition when he re-enters college.

No person shall be considered by any conduct of his own while he is a student in the College to have gained or lost a residence in this state for the purpose of registering in the College. But persons whose legal residence follows that of other persons, as hereinafter provided, shall be considered to have gained or lost legal residnce in this state for such purpose while students in the College according to changes of legal residence of such other persons, except that such legal residence shall not be considered to be so gained until six months after such other person becomes a legal resident of this state.

The residence of minors shall follow that of the legal guardian, regardless of emancipation; but in case a resident of Iowa is appointed the legal guardian of a non-resident minor, the legal residence of such minor for the purpose of this rule shall not be considered to be established in the State of Iowa until the expiration of six months after such appointment.

Aliens who have taken out their first citizenship papers and who have been residents of Iowa for the six months preceding the date of their enrollment in the College will be regarded as eligible for registration as residents of Iowa.

The burden of registering under proper residence is placed upon the student. If there is any possible question of his right to legal residence, the matter should be brought to the attention of the Registrar and passed upon previous to registration or the payment of fees.

Non-resident tuition is payable in advance at the beginning of the quarter. If for any reason an error is made at the time of registration and a non-resident fee is afterwards assessed against the student, this fee must be paid within thirty days after date of such assessment or the student's registration in the College will be cancelled.

FEES FOR LIGHT CLASSIFICATION: Students taking less than the usual schedule pay at the following rates per quarter credit: Engineering, Veterinary Medicine, $3.75; Agricultural Engineering, Home Economics, Industrial Science, Graduate College, $3.25; Agriculture and Non-Collegiate, $2.75. The minimum charge is $10. By an additional payment of $4.00 per quarter, students will be entitled to admission to athletic contests, concerts, lectures and debates, and to subscription to the student publications.

LATE REGISTRATION: An undergraduate student who does not complete his registration and classification on the regular registration days will be required to pay $2.00 extra if he registers on the day following the last registration day. For each day thereafter $1.00 is added. The maximum fine is $10.00.

A graduate student who does not complete his registration and classification by noon of the Saturday following the regular registration days will be charged a late registration fee as follows: If he registers on the following Monday, the fee is $2.00. For each day thereafter $1.00 is added. The maximum fine is $10.00.

This fine does not apply to students entering for the first time.

REGISTRATION FEE FOR PERIODS LESS THAN A FULL QUARTER. Students who register for less than a full quarter will be charged at the rate of 10% of the registration fee for each week during the first five weeks of attendance of the regular college session. The minimum charge will be $10.00. The full Registration Fee will be charged to those who attend six weeks or longer.

WITHDRAWAL FROM COLLEGE: If a student severs his connection with the College, he shall obtain from the Registrar, Room 107, Central Building, an Order to Settle. The College will refund the unused portion of the registration fee, deducting 10% for each week of attendance. No refund is made if the student has been in attendance six weeks or longer.

GRADUATION FEE: The fee for graduation is $15; for certificates, $3.

HOODS FOR DEGREE, DOCTOR OF PHILOSOPHY: Candidates for the degree of Doctor of Philosophy will be required either to purchase or to rent hoods to be used at the time the degree is conferred. Hoods are to be secured through the Registrar.

TRANSCRIPT OF RECORD: Any person who has attended the College is entitled to a certified statement of the work he has completed. His transcript will be sent without charge to the Registrar of another college or to a prospective employer. A fee of $1 will be charged for each additional copy.

BOARD AND ROOM

BOARD AND ROOM FOR WOMEN: All young women are required to secure rooms through the office of the Director of Housing and to live in dormitories unless special arrangement is made through that office. About 700 young women can secure rooms in college residence halls. Rooms are furnished with beds, mattresses, rug, chairs, table, and dresser. Students must furnish bedding and such other articles as they need.

The average price of dormitory rooms is $32 per quarter for each girl. Some third-floor rooms rent for $25 per quarter for each girl. A few rooms with private bath rent for $60 per quarter for each girl. Each student is required to send to the Director of Housing a $5.00 deposit for reservation of room. This deposit is forfeited unless request for cancellation is received before September 1st.

A fee will be charged for all who find it necessary to remain in a dormitory during the winter and spring vacations.

Young women rooming in residence halls are required to board in the dining rooms of their respective halls. The price of board is $4.50 per week. (See note below.)

Two halls, Clara Barton and Alice Freeman, are run co-operatively. These halls house one hundred and sixty-five women. The residents by spending about one hour's time per day in cooking and general house work are able to reduce the cost of board to about $2.50 per week. (See note below.)

Address all correspondence concerning rooms to the Director of Housing, Room 104, Central Building.

BOARD AND ROOM FOR MEN: The room bureau for men is handled by the Young Men's Christian Association. A faculty committee known as the Student Housing Committee supervises the work of the bureau. The price of rooms outside the dormitories at present is as follows: where two occupy a room $1.50 to $2.50 for each occupant per week; where one occupies a room, $2.50 to $4.00 per week. A few rooms are lower than the price here stated and a few are higher, but the above price is the average. Board, at the time this goes to press, may be obtained at from $4.00 to $5.25 per week. The price of room and board, therefore, ranges from $5.50 to $7.00 per week.

Information regarding rooms may be secured by addressing the Secretary of the Y. M. C. A., Iowa State College, Ames, Iowa. New students are advised to secure their rooms before arrival.

Students who expect to join fraternities would do well to defer engaging permanent rooms until they determine whether they wish to live in a fraternity house. Each student must reserve a room before registering. Board usually may be arranged for by the student after reaching Ames.

For the information of students and others interested, the Student Housing Committee has prepared a standard set of rules for houses furnishing rooms to students. The Committee reserves the right to forbid students to room in houses which do not meet the standard requirements. Copies of the regulations may be obtained by applying to the Y.M.C.A. or the Chairman of the Student Housing Committee.

BOARD AND ROOM FOR MEN IN DORMITORIES: About 128 men can be accomodated in the Men's Dormitory which is located near the Men's Athletic Field.

Rooms are furnished with curtains, beds, mattresses, chairs, study tables and dresser. Students must furnish bedding, rugs and such other articles as they need.

The uniform price of dormitory rooms is $32.00 per quarter per man whether a single or double room. Each man who wishes to reserve a room in the dormitory is required to send to the Director of Housing a $5.00 deposit for reservation of room. This deposit is forfeited unless request for cancellation is received before September 1st. Room rent is paid by the quarter and in advance on registeration day. A fee will be charged for all who find it necessary to remain in the dormitory during winter or spring vacations.

Note: Rising food prices may necessitate an increase in the cost of board.

The Men's Co-operative Hall housing about sixty-five selected upperclassmen affords an economical and home-like place in which to live. With the exception of the cooking the men living in the hall do all the general housework which demands about one hour of time each day. The cost for the past year has been $5.00 per week for room and board. (See note below.)

Address all correspondence concerning rooms to the Director of Housing, Room 104, Central Building.

ROOMS FOR MALE FOREIGN STUDENTS: A limited number of male foreign students may find accomodations in the International House. The uniform room rent is $2.25 per week whether in a single or double room. Meals are not served.

Each man who wishes to reserve a room in the International House is required to make a $5.00 deposit for reservation of room. This deposit is forfeited unless a request for cancellation is received before September 1st. Room rent is paid by the quarter and in advance on registration day. Address all correspondence concerning rooms to chairman of International House Committee, 315 Central Building.

ESTIMATE OF NECESSARY EXPENSES FOR THE AVERAGE STUDENT DURING HIS FIRST YEAR IN COLLEGE

	Agriculture	Engineering	Home Economics	Industrial Science		Veterinary Medicine
	Men	Men	Women	Men	Women	Men
Matriculation Fee	$ 10.	$ 10.	$ 10.	$ 10.	$ 10.	$ 10.
Registration Fee	90.	118.	108.	108.	108.	118.
Books and Supplies	30.	*45.	30.	30.	30.	45.
Board (36 weeks)	162.	162.	162.	162.	162.	162.
Room (36 weeks)	72.	72.	96.	72.	96.	72.
Gym. Suit & Towel Fee**	6.	6.	5.	6.	5.	6.
Military Shoes & Belt***	4.	4.		4.		4.
Total	$374.	$417.	$411.	.392.	$411.	$417.

*Students who have drawing instruments and a slide rule may deduct from $10 to $15 from this figure.

**At the beginning of the freshman year, each man will be required to purchase gymnasium equipment for approximately $4.50 and pay a towel service fee of $1.00. The price for uniform and supplies in physical education for women will vary from $3.50 to $6 depending on the course chosen.

***Members of the R. O. T. C. will have their uniforms furnished by the government. Each student must furnish his own tan shoes of military pattern and a tan leather waist belt The cost of these items will be approximately $4. Students who are not members of the R. O. T. C. may receive information as to the prices of uniforms from the head of the Military Department.

Students who are not residents of the State of Iowa should add $40 a year for tuition.

Note: Rising food prices may necessitate an increase in the cost of board.

By obtaining cheaper board and room or by living in the co-operative dormitories, many students will be able to live for less than the amounts estimated above.

The above estimates do not include the cost of clothing, transportation, and incidentals. The student's general expenses (in addition to the items listed above) are subject to the personal habits of the individual and vary according to the degree of economy exercised.

Taking into consideration the items named under Fees and Expenses, it is estimated that not many freshman students will succeed in going through the first quarter for less than $150 to $200. On arrival at Ames to begin work, a student should have about $100 in order to meet the registration fee, the cost of books, equipment and gymnasium outfit, and the required advance payment for room and board.

Prospective freshmen should carefully consider the cost of the first year. No one should think of entering college unless he has money enough in his own right or from friends to meet his expenses in large part for his freshman year. If he goes out of this year in debt, he is quite sure to be seriously embarrassed for the remainder of his college course. Provisions should be made to meet college bills with the same business-like promptness with which one expects to meet other bills. For information concerning employment for students, see page 53.

FEE EXEMPTIONS, LOANS, AND SCHOLARSHIPS

FEE EXEMPTIONS are granted under the following conditions.

(1) The applicant must be in need of financial assistance.

(2) The applicant must be of good moral character.

(3) The applicant must give evidence of ability, by good standing in one of the regular curricula.

(4) All exemptions are granted for one quarter only.

(5) An average grade of "C" or 2 quality points is required of all students classified in the Junior College. For all students in the Senior College an average of 2.5 quality points is required. Also the student must not have any unremoved conditions or failures on his record.

(6) Any misrepresentation will cause the exemption to be withdrawn and will make all former exemptions due and subject to payment.

Men students should apply to the Director of Personnel for Men, 117 Central Building, and women students to the Director of Personnel for Women, 119 Central Building.

Applicants for fee exemptions fall into three classes according to the location of their homes:

(1) Residents of Iowa. This amounts to $20 a quarter and is restricted to students whose parents are residents of Iowa.

(2) Residents of states other than Iowa. A limited number of non-residents may receive an exemption of $40 a year ($14 Fall Quarter, 13 Winter and Spring Quarters) which covers the out-of-state tuition.

(3) For foreign students. This amounts to $20 per quarter. There are seven exemptions of this class.

EXEMPTIONS FOR WORLD WAR VETERANS: All honorably discharged soldiers and sailors of the World War who are citizens of Iowa shall

be exempt from fees to the amount of $40 a year, provided the present plan is continued by the next General Assembly of Iowa.

LaVerne Noyes Scholarship for World War Veterans and Their Descendants: LaVerne Noyes of the class of 1872 left by his will a large portion of the income from his estate to be used in certain colleges and universities for assistance to students who served in the World War or to their descendants. The fund is administered by the trustees of the estate of LaVerne Noyes and is recommended only for students of good standing needing assistance.

Application for such scholarships at Iowa State College should be made to the Chairman of the Loan Committee.

State Fair Board Scholarships: The State Fair Board offers scholarship prizes in this institution amounting to $600, open to both collegiate and non-collegiate students in agriculture. These scholarships are awarded at the Iowa State Fair and are based upon boys' stock and grain judging contests. There are six scholarships, ranging from $25 to $175. The winners of the contest receive the money in monthly installments during the year of college work. The winners of the two $25 scholarships may use them either for the Winter Short Course, or for the regular work in Agriculture. These scholarships offer opportunities for young men to receive substantial aid toward paying the expenses of a college education; many excellent students have come to this institution by this means.

Loan Funds: The following loan funds available to junior and senior students with good collegiate records are administered by committees of the faculty:

The Wattles Loan Fund.....(For Men)
Bachelor Debating Society Loan Fund.....(For Men)
International Harvester Loan Fund.....(For Men)
Quaker Oats Loan Fund.....(For Men)
Pullman Scholarships..(For Men in Agricultural Courses)
Julia McCulloch Smith Memorial Loan Fund.(For Women)
Georgia White Loan Fund.....(For Women)
Catherine MacKay Loan Fund.....(For Women)
Harriet Newens Loan Fund.....(For Women)
Frances A. Shelden Memorial Loan Fund....(For Women)
Faculty Women's Club Accommodation Fund (For Women)
Alumni Trust Loan Fund .....(For Men and Women)
Henry Strong Foundation.....(For Men and Women)
Cosmopolitan Club Loan Fund....(For Foreign Students)

The Alumni Trust Loan Fund has been augmented by gifts from:

The All Dormitory Council
The Cardinal Guild
Class of 1909
Class of 1914
Class of 1923
Professor H. J. Gilkey
Professor Nelson Horn
E. J. Kearney, '93

Irving Smith, '95
Professor F. V. Vilbrandt
Professor E. H. Wilmarth
The Iowa for Hoover Club
Sigma Xi Fraternity

and loans from:

Fifty members of the college faculty
Agricultural Engineering Staff
American Association of University Women
The Cardinal Guild
Engineering Council
Delta Phi Delta Fraternity
Epsilon Sigma Phi
Gamma Sigma Delta Fraternity
Ames Business and Professional Women's Club
Horticulture Club
Iowa Homemaker
Jack O'Lantern Fraternity
Phi Upsilon Omicron Fraternity
Pi Mu Epsilon Fraternity
Sigma Delta Epsilon Fraternity
Sigma Xi Fraternity
Women's I Fraternity
WOI Book Club.

In addition, the following organizations are also assisting students: Federated Women's Clubs, P. E. O. Society, Knights Templar, Rotary Club, various churches and other organizations.

Information regarding any of the above may be obtained from Maria M. Roberts, 104 Central Building.

GENEVA SCHOLARSHIP: The Faculty Women's Club contributes $50 towards the expenses of a delegate to the Y. W. C. A. Central Student Conference at Lake Geneva. This fund is awarded each Spring Quarter to a sophomore student. Scholarship, accomplishment in Y. W. C. A. work, interest in general college activities, and personality are the points considered in making the award.

HENRY STRONG FOUNDATION. The Henry Strong Educational Foundation allots a certain amount of money each year for the making of loans to upper classmen. Candidates are recommended by our loaning officer or loaning committee. Interest at 4% accrues after graduation. All repayments are again credited back to Iowa State College for use in making additional loans. No loans can be made to students over twenty-five years of age.

STORY COUNTY ALUMNI ASSOCIATION PRIZE: The Story County Alumni Association will provide suitable recognition each year to the senior student receiving the highest honors in scholarship.

JULIA MCCULLOCH SMITH MEMORIAL AWARD. A prize of $25.00 is awarded to the senior woman making the highest average in scholarship during at least seven consecutive quarters preceding January 1st of her senior year, unless this student is also the winner of the Story County Alumni prize in which case it shall be given to the senior woman having the second highest scholastic standing. The award is given only to a

student who is unquestionably high in character, in initiative, and in intellectual attainment.

A. A. U. W. FELLOWSHIP. The Ames branch of the American Association of University Women offers an annual fellowship which includes tuition, board and room, to a foreign woman student.

JOSTEN'S SCHOLARSHIPS. Members of our student body are eligible to compete for the Josten's National Art Essay Contest Scholarship, $200; Josten's Iowa Art Essay Contest Scholarship, $50.

EMPLOYMENT FOR STUDENTS

A large number of students earn a part of their expenses while in college, but no one should expect to earn all his expenses unless he has made definite arrangements before coming. A student should not plan to carry outside labor in the first quarter of attendance, since his full energies are demanded for adjustment to the new situation. In all cases, the heavy laboratory work necessitates careful planning to prevent outside labor from interfering with studies. Many students lighten their schedule by remaining in college one or two extra quarters, and thus have time for outside labor.

Various departments of the college provide employment for students in such lines as office work, caring for stock, janitor work, and helping in the dairy, greenhouses, orchards, and shops. Students should feel free to consult heads of departments concerning such matters. Considerable work is available in the business houses and homes of Ames; a number of students find employment in student clubs and in the Memorial Union Commons and dining rooms. The ingenuity, resourcefulness, and determination of students have developed a great variety of ways of self-help.

An employment service for men is maintained by the College Y. M. C. A. The Director of Personnel for Women will confer with women students desiring employment. Students seeking information regarding opportunities for work at the college should correspond with these offices.

The heads of certain departments are able to secure employment for a large number of students during the summer vacations. Such positions afford practical work that is closely related to the instruction given in college.

MANUAL LABOR CONNECTED WITH LABORATORY EXERCISES

The following regulations in regard to manual labor have been adopted by the Board of Education:

1. The manual labor of students is divided into two kinds. Uninstructive labor, which shall be paid for in money; and instructive labor, which shall receive compensation from the instruction given and the skill acquired.

2. Uninstructive labor shall comprise all the operations in the workshop, in the garden, upon the farm, and elsewhere, in which the work done accrues to the benefit of the College, and not to that of the student. Instructive labor shall embrace all those operations in the workshop, museum, laboratories, veterinary hospital, experimental kitchen, gardens,

experimental stations, and on the farm, in which the sole purpose is the acquisition of knowledge and skill.

3. Students shall engage in instructive labor in the presence of the professor in charge, and under his instruction according to the statement made in each of the courses of study.

The compensated labor furnished by the Division of Agriculture, of Veterinary Medicine, and of Engineering, is given by each to its own students and is eagerly sought. Compensated labor is awarded to the most faithful and meritorious students in each department. This labor is paid for according to its value to the College, but no student should expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and even if it could, the student's time is needed chiefly for study. Still, many worthy and industrious students pay a considerable part of their expenses by labor; over $25,000 is paid out by the College each year to students and graduate assistants.

STUDENT RELIEF EMPLOYMENT

On February 1, 1934, under grant of funds from the Federal Emergency Relief Administration, money was made available for employing students during the remainder of the academic year, the total number not to exceed ten per cent of the full-time student enrollment as of October 15, 1933. The students were selected for employment in college departments on the basis of need, character, and ability to do college work. Not more than 75 per cent of the funds were paid to students enrolled in college during January, 1934. The jobs were allocated between men and women in proportion to the enrollment. Students were permitted to work not to exceed thirty hours a week or eight hours in any day. The hourly rate of pay was such as commonly paid by the college for the types of service rendered, but the rate was not less than thirty cents an hour. The maximum pay for each calendar month was twenty dollars for each student; the average amount earned did not exceed fifteen dollars per student.

Under this plan three hundred and twenty men and eighty-seven women were able to attend college during the Winter and Spring Quarters. They earned a total of $13,704.69 for 43,844 hours of work between February 1 and June 9.

The Federal Emergency Relief Administration approved a plan similar to the one above for the school year 1934-35. On the basis of $15.00 a student for twelve per cent of our enrollment as of October 15, 1933, a total of $5,505.00 was allocated for each month of the academic year. Employment was assigned to students who were needy and who had shown ability to do high grade college work. More than 500 men and women were able to earn a considerable part of their expenses under this plan.

This Federal help was continued during the school year 1935-36, under the National Youth Administration. Based upon 12% of our enrollment as of October 15, 1934, at $15 per student, an allotment was made of $6,345 for each month of the academic year. In addition, a

graduate program provided an allotment of $25 per month for 21 first-year graduate students and $30 per month for 26 advanced graduate students.

More than 730 students received this help during the Fall Quarter, 1935.

Classification and Standing

JUNIOR AND SENIOR COLLEGE: The Junior College includes all students in the freshman and sophomore classes; the Senior College, all students in the junior and senior classes.

AMOUNT OF WORK: The amount of work in each subject is expressed in credits. A credit represents one recitation (involving two hours of preparation) or one three-hour laboratory period or other combination of teacher contact and outside preparation involving a total of three clock hours per week for 12 weeks.

NUMBER OF CREDITS: No student may classify in more than the maximum number of hours allowed in his curriculum per quarter unless by his previous record he has shown exceptional ability. The student will be allowed to drop such extra work only upon permission of the classifying Dean; he may be required to drop it in case this or any other work in his schedule is being carried unsatisfactorily.

In general, students failing in any portion of a quarter's work will not be allowed to take full classification for the next quarter.

CLASSIFICATION: No student may be admitted to any class or dropped from it except by authority of the classifying officer.

CONFLICTS: Students may not classify in conflicting courses without the approval of the departments concerned.

MARKING SYSTEM: The following system is used by instructors in reporting grades to the Registrar: A, Exceptionally high; B, Superior; C, Average; D, Lowest passing mark; E, Condition; F, Failed; W, Withheld; X, Dropped. For graduate students the lowest passing mark is C. Graduate students may also be given the mark P, Passed, to indicate satisfactory progress in any course which can not be more definitely evaluated at time of report.

QUALITY POINTS: For each hour of work assigned, the student receives quality points, according to the grade attained as follows: Grade A, 4 points; B, 3 points; C, 2 points; D, 1 point; E and F, 0 points.

GRADUATION: A student intending to graduate shall not be eligible if he lacks at the beginning of his last quarter more credits, not including "Conditions" or "Withhelds," than the number in which he would be entitled to classify as determined by his average for the preceding quarter. A student shall not have the privilege of removing "Conditions" or "Withhelds" or securing substitutions later than the middle of the quarter in which he is to graduate. No credits will be accepted after this date for any courses except those included in the classification of the current quarter.

An average of at least 2 quality points per credit in all courses taken is required for graduation.

RESIDENCE REQUIREMENT: A candidate for a baccalaureate degree must have spent at least one year in resident study in this College and must have earned 45 quarter credits in residence during the last year of work for such degree.

STUDENTS' ENGLISH: A growing recognition of the importance of English and of the need of a higher standard of expression by students throughout the college has resulted in the adoption of the policy of granting diplomas only to those students whose written and spoken use of the language measures up to a fair standard of clearness and accuracy. For carrying out this policy a Committee on Students' English has been appointed. This committee, with the co-operation of departmental and divisional advisers, provides assistance for students weak in English and, if necessary, assigns students to additional courses in English.

BACK STUDIES: Students are required to classify in back studies at the earliest opportunity. Any exception to this rule must be for a good reason and must be approved by the classifying officer.

CHANGING CURRICULUM: If a student who has grades below "D" in more than 5 credits wishes to change from one curriculum to another, his request must be approved by a committee consisting of his counselor and the head of the curriculum to which he wishes to transfer. Junior college students must also secure the approval of the Dean of the Junior College. Senior college students must secure the approval of their divisional dean.

Examinations in Back Work

For matriculated students, examinations in back work will be conducted at the opening of the Fall Quarter, on September 17 and 18, as follows:

THURSDAY

8 A. M. to 10 A. M.

Farm Crops	Room 307, Agricultural Hall
Mining Engineering	Room 102, Chemical Engineering Building
Physics	Room 5, Physics Building
Zoology	Room 309, Science Building

10 A. M. to 12 M.

Electrical Engineering	Room 231, Engineering Annex
Civil Engineering	Room 312, Engineering Hall
Mathematics	Room 221, Central Building
Forestry	Room 210, Agricultural Hall
Geology	Room 299, Chemistry Building
Veterinary Medicine	Veterinary Building
Vocational Education	Room 108, Agricultural Annex

1 P. M. to 3 P. M.

Chemical Engineering	Room 102, Chemical Engineering Building
Mechanical Engineering	Rooms 204 and 205, Engineering Hall
Military	Room 2, Armory
Landscape Architecture	Room 1, Landscape Studio

2 P. M. to 4 P. M.

Government	Room 303, Central Building
History	Room 303, Central Building
Psychology	Room 210, Central Building

FRIDAY

8 A. M. to 10 A. M.

Animal Husbandry	Room 116, Agricultural Hall
Ceramic Engineering	Room 110, Engineering Annex
Chemistry	Room 198, Chemistry Building
Horticulture	Room 210, Agricultural Hall
Industrial Arts	Room 201, Industrial Arts Building

10 A. M. to 12 M.

Agricultural Economics	Room 208, Agricultural Annex
Architectural Engineering	Room 216, Engineering Annex
Botany	Room 212, Botany Building
Dairy Industry	Room 105, Dairy Industry Building
Economics	Room 208, Agricultural Annex
English	Room 18, Central Building

1 P. M. to 3 P. M.

Technical Journalism	Room 102, Agricultural Annex
Genetics	Room 318, Agricultural Hall
Home Economics	Home Economics Building
Theoretical & Applied Mechanics	Room 208, Engineering Hall
Public Speaking	Room 310, Central Building

2 P. M. to 4 P. M.

Agricultural Engineering	Agricultural Engineering Laboratory
Modern Language	Room 315, Central Building
Bacteriology	Room 105, Science Hall
Library	Library
Soils	Room 19, Agricultural Hall

For the Winter Quarter, examinations will be given on January 2, 1937, the hours being the same as given above. For the Spring Quarter, examinations will be given on March 22, 1937, the hours being the same as given above. For the Summer Quarter, examinations will be given on June 15, 1937. and July 22 1937, Conflicts will be arranged by the departments concerned.

Degrees

In the Divisions of Agriculture, Engineering, Home Economics, and Industrial Science, the baccalaureate degree conferred is Bachelor of Science. The degree of Doctor of Veterinary Medicine is conferred upon the completion of the curriculum in Veterinary Medicine. In the Graduate College the degrees conferred are Master of Science, Doctor of Philosophy, and Professional Degrees in Engineering.

Undergraduate Thesis

Candidates for graduation in certain curricula are expected to present satisfactory theses unless other subjects are substituted. The subjects for theses are selected in consultation with the heads of departments.

The filing of undergraduate theses in the library is optional with the department heads concerned, in consultation with the Librarian.

Division of Agriculture

DEAN KILDEE, Agricultural Hall, Room 123N

The Division of Agriculture is made up of all the departments in the College devoted to the various phases of technical and practical agricultural work. The work of these departments is closely related, and the purpose of all of them is to train men for better service in agriculture.

In addition to the training of research workers, teachers, extension workers, workers in all types of business, commercial and professional activities connected with Agriculture, and managers of specialized and large scale farm enterprises, the Division of Agriculture has as one of its objectives the training of young men for general farming and rural living.

The faculty of the Division of Agriculture is made up of the members of all the departments within the Division and representatives of the departments in other divisions whose work serves to prepare agricultural students for a better mastery of technical work in agriculture.

The departments in Agriculture are: Agricultural Economics and Rural Sociology (administered jointly with the Industrial Science Division), Agricultural Engineering, (adminstered jointly with the Engineering Division), Agronomy, Animal Husbandry, Dairy Industry, Genetics, Horticulture and Forestry, Landscape Architecture, Technical Journalism, Vocational Education.

The following curricula in Agriculture are offered:

(For Non-Collegiate Curricula, see page 286)

These curricula afford the student opportunity for pursuing study along that line of agriculture, which he is especially suited to follow. The

farm, as it is usually conducted, is a combination of many branches of industry; and these curricula are so arranged as to direct the student into that branch which will call forth and centralize his special ability, and at the same time will prepare him to meet successfully the peculiar difficulties of his chosen work.

In the curricula in practical and scientific agriculture, a wide field of study is open to our students. The national government endowment fund and annual appropriations for original experimentation and instruction in agriculture and the sciences related to this industry, supplemented by state aid, enable the College authorities to make the fields, barns, orchards, and gardens, laboratories of extensive and most practical investigation and instruction.

The Agricultural Experiment Station is bringing to light better methods of feeding, more remunerative systems of cropping, more valuable strains of fruits, crops, and livestock, more remunerative systems of marketing agricultural products, and other improvements. These investigations are studied by the students first hand, and through the system of student employment a number take an active part in carrying on the work of the Experiment Station. This arrangement gives to the students clearer insight into scientific methods and at the same time valuable, practical experience.

In addition to laboratory work at the College, students are encouraged to visit various commercial enterprises throughout the state. Farms, orchards, stock shows, and other commercial institutions that have proved themselves of particular merit are visited by students in company with specialists from the College.

The curricula in this Division are designed to teach the sciences that underlie practical agriculture, and sufficient English, literature, mathematics, history, and other supplementary subjects to sustain both scientific and practical agriculture and to develop the agricultural student to the level of the educated in other professions.

Special attention is given to improved methods in all the various operations of farming and farm building, in the use of tools and machinery, and in the management of all kinds of stock and crops. Instruction embraces not only the principles but also the practice of agriculture. The great practical value of the curricula is shown by the records of those students who have completed them and who have gone back to the farm; it is also shown by those who upon graduation have taken up the work of specialists as teachers or investigators. Such men are proving themselves leaders in their various lines.

Economic and social phases of agriculture no less than technical factors come in for careful attention in successful farming. Marketing, cooperative methods, farm management, and community organizations are made the basis of special four-year curricula for farm managers, marketing specialists, and community leaders. The College is seeking to render a much needed service by providing a thoroughly practical and scientific training for such work.

The Division offers exceptional opportunity to graduate students in Agriculture. The strong instructional staff and extensive equipment draw students from many states.

TEACHING AND RESEARCH FELLOWSHIPS AND SCHOLARSHIPS. There are about fifty-two teaching and research scholarships, fellowships, and assistantships awarded annually in the Division of Agriculture to graduate students. Application should be made during the first or second quarter of the preceding year. For stipends and further details, see Fellowships and Scholarships, page 84.

TUITION SCHOLARSHIPS. For information, see Fee Exemptions, page 50.

QUAKER OATS COMPANY SCHOLARSHIP. The Quaker Oats Company, of Chicago, offers a special $50 scholarship at the Iowa State College to the individual having the highest score in the crops judging contest at the Iowa State Fair.

AGRICULTURAL JOURNALISM SCHOLARSHIP. The John Clay Agricultural Journalism Fund provides an income which permits the award of a graduate assistantship in Agricultural Journalism.

CHARLES LATHROP PACK PERMANENT FORESTRY PRIZE FUND. This fund of two thousand dollars has been provided by Charles Lathrop Pack, President of the American Tree Association. The annual income from this fund is to be used for prizes in developing more effective writing and speaking among technical forestry students. The topics may deal with any forestry or closely related subject. There will be two first prizes of $35 each and two second prizes of $15 each. One first prize and one second prize will be available for award to the best essay submitted by students of the combined freshman and sophomore classes and another first and second prize of like amount to those submitted by upper classmen. The competition is open to all forestry students.

THE GAMMA SIGMA DELTA-ALPHA ZETA SCHOLARSHIP PRIZE. To encourage superior work and to reward the student for conscientious effort during his freshman year, the honor societies of Gamma Sigma Delta and Alpha Zeta are jointly offering a prize to the freshman student having the best scholastic record in the Division of Agriculture.

THE GEORGE GUND ANIMAL HUSBANDRY SCHOLARSHIP. This Scholarship of $200 is given annually by Mr. George Gund of the Gund Realty Company of Cleveland, Ohio. It is awarded by the Animal Husbandry staff to the senior student majoring in Animal Husbandry, who as a junior, made the best record in scholarship, character, and initiative.

RUSSELL I. KLOPP MEMORIAL. Dr. Henry I. Klopp has established a fund in memory of his son, Russell I. Klopp, who lost his life shortly after graduation in 1923. The income of this fund, approximately $20, is offered as a prize each year to the senior student in Horticulture who has made the highest average standing during his junior and senior years.

GEORGE H. WALKER PRIZE. This prize consists of the annual income of the permanent fund of one thousand dollars donated by George H. Walker of Boston, Massachusetts, one of the founders of the Walker-Gordon Milk Company. It is awarded annually to a senior in Dairy Industry or Dairy Husbandry who has made outstanding progress in the study of milk.

ZIMMERMAN MEMORIAL PRIZE. Mr. W. F. Zimmerman of Chicago has established a permanent fund in memory of his son, Herbert, an exemplary young man who lost his life through an accident while enrolled as a student in the Department of Horticulture. The income of this fund now not less than $20, is offered as a prize each year to a superior junior horticultural student.

The award will be made on the basis of ability, scholarly attainment, character, and interest in affairs which are worthy the attention of students who are preparing themselves to do the best possible work as horticulturists and as citizens.

RYERSON TRAVELING FELLOWSHIP. Each year two distinguished senior students in Landscape Architecture and two in Architectural Engineering are selected as collaborative teams to compete with similar groups from accredited midwestern schools for the Ryerson Traveling Fellowship. The award is valued at $1,500 for each winner, one Landscape Architect and one Architect, to be used for European travel and study.

CLUBS AND AGRICULTURAL ORGANIZATIONS.

Name	Time of Meeting	Place
Agricultural Council	On call	Room 109, Agricultural Hall
Agricultural Education Club	3rd Thurs. of mo., 7:15 p.m.	Room 232, Memorial Union
Agricultural Economics Club	On call	Fraternity Houses
Agricultural Journalism Club	Thurs., 11:00 a. m.	Room 107, Agricultural Annex
Alpha Zeta Fraternity	Bi-monthly, Tues. of mo., 7:30 p. m.	Room 109, Agricultural Hall
Block and Bridle Club	Monthly, Thurs., 11:00 a. m.	Room 117, Agricultural Hall
Dairy Cattle Club	One meeting a mo. on call, 7:15 p. m.	Room 117, Agricultural Hall
Dairy Club	1st Thurs. of mo., 11:00 a. m.	Dairy Industry Assembly
Forestry Club	Bi-monthly, Th., 7:30 p. m.	Room 228, Agricultural Hall
Gamma Sigma Delta Fraternity	No regular time of meeting	
Horticultural Club	On call bi-monthly	Room 205, Plant Laboratory
Iowa Section, Amer. Society of Agronomy	2nd and 4th Wed. of mo., 4:00 p. m. (from November to March)	Room 19, Agricultural Hall
Iowa Student Branch, Amer. Society of Agr. Engrs.	Weekly, Fri., 10: a. m.	Room 128, Agricultural Engineering Laboratory
Poultry Club	1st and 3d Wed. of mo., 7:00 p. m.	Room 117, Agricultural Hall
Student Section, Amer. Society of Agronomy	2nd and 4th Thurs. of mo., 7:30 p. m.	Room 19, Agricultural Hall
Vistonian Club	Weekly, 11:00 a. m.	Room 1, Landscape Studio
Wenugana Club	On call monthly.	Memorial Union

HONORARY AGRICULTURAL FRATERNITIES. There are two national honorary agricultural fraternities that have chapters at the Iowa State College, the Alpha Zeta and the Gamma Sigma Delta. Eligibility to Gamma Sigma Delta is based entirely upon scholarship, and membership is limited to a group of ranking students of the senior class and the graduate school in the Divisions of Agriculture and Veterinary Medicine, and up-

on recommendation from department heads in the Division of Industrial Science, to graduate students who have subjects allied to Agriculture. Membership in Alpha Zeta is limited to the upper one-fifth of the junior class and the upper one-fourth of the senior class in the Division of Agriculture, and selection is made on the basis of scholarship, character, and qualities of leadership.

TAU SIGMA DELTA, a national honorary fraternity in Architecture and Landscape Architecture. In the spring of 1930, Kappa Chapter of Tau Sigma Delta, honorary fraternity in Architecture and the Allied Arts, was founded at Iowa State College. This is strictly an honorary fraternity in the Fine Arts, the sole purpose of which is to honor exceptional students. Selections are made from the highest ranking students in the departments concerned. Student and professional exhibits are held to encourage interest in high artistic attainment.

AGRICULTURAL PUBLICATIONS. The students in the Division of Agriculture, under the general supervision and direction of the Department of Technical Journalism, publish a monthly journal known as The Agriculturist. This publication has taken high rank in its class, and it affords students an opportunity to get practical training and experience in agricultural writing. In addition, considerable of the most meritorious work of advanced students in Agricultural Journalism is used by the agricultural press and by daily and weekly papers.

The Ames Forester is an annual published by the Forestry Club. The students, with the assistance of the alumni working in the field, have made this an attractive publication of a technical character.

Horizons is a quarterly Landscape Architecture magazine published by the students of the Landscape Architecture Department.

AGRICULTURAL PERSONNEL SERVICE. The Agricultural Division, through its Personnel Office, supplements and co-ordinates the effort made by the departments to establish definite contacts with those industries, commercial organizations, and Federal and State agencies that employ men who have had technical training in any of the departments of agriculture. This service includes the assistance given the members of each graduating class, the alumni and former students who desire to change positions, and the undergraduates who temporarily drop out of college or who seek agricultural or commercial experience during vacation periods.

During the past four years, 785 students have received degrees from the Division of Agriculture. Of this number 97% are permanently employed in the lines of work for which they made preparation.

Division of Engineering

DEAN AGG, Engineering Hall, Room 210

The Division of Engineering consists of all the College departments devoted mainly to technical engineering work, which are grouped for the purpose of co-ordinating their work and promoting its quality and efficiency. It was organized about 1898 and a dean of engineering was appointed in 1904.

The faculty of the Division of Engineering is made up of all the members of the staffs of the departments within the Division.

The departments in Engineering that offer work leading to undergraduate or graduate degrees, or both, are as follows:

The following departments are organized for special services:

The Civil and Mechanical Engineering curricula were established in 1868 when the College first opened. Electrical Engineering was added in 1891, Mining Engineering in 1894, Ceramic Engineering in 1906, Chemical Engineering and Agricultural Engineering in 1909, Architectural Engineering in 1914, Industrial Arts in 1920, General Engineering in 1926, Theoretical and Applied Mechanics in 1931, and the Department of Engineering Drawing in 1935.

The Engineering Experiment Station is the research organization of the division, and the Engineering Extension Service is engaged principally in educational work away from the College, including short courses both on the campus and at various places around the state. It also provides a technical information service. The activities of these two departments are quite different in character from those of the teaching departments within the Division, but are closely co-ordinated with the regular collegiate instruction.

ENGINEERING DEGREES. The four-year curricula lead to the degree of Bachelor of Science, with mention of the specific course taken.

Co-operative five-year curricula have been arranged in co-operation with several Iowa colleges. (See page 39.) Each five-year co-operative curriculum leads to two degrees: First, Bachelor of Science or Bachelor of Arts; second, Bachelor of Science in Engineering.

Students who complete three years with at least 156 quarter credits in any engineering curriculum in this college and who subsequently complete the first year of the law curriculum in a recognized law college will be granted the degree of Bachelor of Science by this college upon transferring their law credits back to this institution and upon satisfying the quality point requirement. Those interested in such a combined curriculum should notify the Dean of Engineering early in their course so that a special program may be outlined.

Graduates in liberal arts from colleges of high standing usually can secure an Engineering degree at the Iowa State College by about two years of additional technical work. (See page 39.)

In addition to the undergraduate engineering work, graduate work is also offered by each of the departments in the Division.

The degree, Master of Science in Agricultural Engineering, Architectural Engineering, etc., is conferred upon the satisfactory completion of a year of resident graduate study.

The degree, Doctor of Philosophy, is conferred upon the satisfactory completion of three years of graduate study. The degree of Doctor of Engineering is conferred only as an honorary degree.

The professional engineering degrees of Agricultural Engineer, Architectural Engineer, Ceramic Engineer, Civil Engineer, Industrial Engineer, Electrical Engineer, etc., are conferred on the basis of successful engineering practice after receiving the Bachelor of Science degree in Engineering. (See page 82.)

SELECTION OF DEPARTMENT BY THE STUDENT. For two quarters all engineering freshmen take identical work and do not classify for any particular field of engineering. At the beginning of the Spring Quarter of the freshman year the student will select the field in which he wishes to study and classify in the department he selects from the list which appears near the top of the preceding page. While it is expected that the student will have decided upon his field of engineering by the beginning of the Spring Quarter of his freshman year, he may, at the end of the freshman year change his curriculum with the consent of the Dean of Engineering and the Dean of the Junior College, subject to existing faculty rules and the following conditions:

The student may be required to make up those subjects required in the freshman year of the new curriculum, but not taken in the original curriculum; but in such cases, the studies taken in the original curriculum which are not required in the new curriculum may be applied toward graduation. Students may change to the curriculum in General Engineering up to the end of the sophomore year on a basis corresponding to that prescribed above.

OBJECTIVES. The purpose of each of the engineering curricula is to afford the student opportunity to secure the thorough, fundamental, and technical education which is necessary for professional work of the highest grade in engineering; and, in addition, insure the developing of

those physical, mental, moral, and social qualities which are essential to high professional attainment. Many powerful college influences, in addition to the regular instruction, contribute to this broader education of the student.

Personal contact is sought between the students and engineers of high attainments in the faculty through a system by which each student is assigned to a faculty counsellor who confers frequently with the student about his work.

The fundamental studies come mainly in the freshman and sophomore years, and include Mathematics, Chemistry, Physics, English, and Economic Science. Their importance to the engineer can hardly be overemphasized for they are the foundation for the whole superstructure of his technical education.

Through the medium of instruction in a special course called Engineering Problems the engineering student is taught, even in his freshman year, to make direct application of mathematics and physics to typical engineering problems.

The technical studies occupy about 30 per cent of the engineering curricula during the freshman and sophomore years, and the greater part during the junior and senior years. The technical studies are of too great variety to be mentioned in detail here, but are fully explained in the descriptions of the several engineering curricula.

Besides the regular courses of the engineering curricula, other agencies contribute in an important degree to the professional education of the engineering student. Among the more important of these are the following:

TECHNICAL LECTURES. Throughout the freshman year all engineering students meet for technical lectures delivered by members of the engineering faculty and engineers who are engaged in professional work who are brought in for the purpose. These lectures constitute a general introduction to the nature of and opportunities in the engineering profession.

ENGINEERING SOCIETIES. General professional association and advancement are promoted by the activities of the student branches of the great national engineering societies, of which the following are represented: American Ceramic Society, American Institute of Electrical Engineers, American Institute of Mining Engineers, American Society of Agricultural Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Chemical Engineers, Industrial Arts Society, and Society of Industrial Engineering.

THE ENGINEERING COUNCIL is the governing body of the student organizations in the Engineering Division. The council is made up of delegates representing all the departmental student technical societies and directs certain activities that are carried out by the student body. Among these are the Engineering Carnival, in the fall; the Engineering Open House, every spring, and similar engineering social affairs. The council each year invites a few prominent engineers to visit the college and address the students on subjects of general interest to the profession.

ENGINEERING SEMINARS. Engineering seminars are a feature of the advanced engineering work and are common to practically all depart-

ments. In several departments the work is merged with that of the engineering societies.

TAU BETA PI. This national honorary engineering society maintains a strong local chapter, to which only the highest one-fourth (in scholarship) of seniors, the upper one-eighth of the juniors, and the sophomore having the highest average, are eligible for election. A feature of the work of the chapter is an annual address to the freshman and sophomore engineers by some prominent outside engineer.

ETA KAPPA NU. This is a national honorary electrical engineering fraternity maintaining a local chapter at the Iowa State College.

THE IOWA ENGINEER. The engineering students publish monthly during the college year an engineering journal called "The Iowa Engineer." Articles are contributed by engineering alumni, non-resident engineering lecturers, and members of the engineering faculty, as well as by the student editors and reporters. Engineering journals are becoming so numerous and important that experience on "The Iowa Engineer" staff is very valuable.

OPPORTUNITIES FOR ENGINEERING GRADUATES. The tremendous modern development of industry in the United States requires in normal times technically trained men in great numbers for supervisory and executive positions of the most responsible character as well as for purely technical work. It is forecast that future graduates in engineering will have ample opportunity for professional employment of an interesting and lucrative character.

ENGINEERING PERSONNEL SERVICE. The Engineering Division, through its Personnel Office, establishes definite contacts with those industries and commercial organizations that employ men who have had technical training in any of the departments of engineering. This service includes the assistance given the members of each graduating class, the alumni who desire to change positions, and the undergraduates who stay out of college for a time or who seek industrial experience during vacation periods.

Division of Home Economics

DEAN FISHER, Home Economics Hall, Room 122

The Division of Home Economics consists of the departments of Applied Art, Child Development, Foods and Nutrition, Household Equipment, Home Management, Institution Management, Physical Education, Textiles and Clothing, and Home Economics Education. It is the aim of the Division to co-ordinate the work of these departments with the general cultural and scientific subjects so that a well rounded four-year curriculum is offered. Specialization is provided by major sequences in the several departments.

The Division of Home Economics offers the following curricula:

(For graduate courses, see page 86.)

THE CURRICULA IN HOME ECONOMICS are planned to meet the needs of those who desire a good foundation in the study of subjects relating to the economic, artistic, scientific, and social problems of the home; of those who desire the work as part of a liberal education; of those who wish to teach in secondary schools or colleges; of those who wish to prepare themselves for other vocations in related lines of work; and of those who wish to undertake research work.

SUPERVISED TEACHING. Through co-operative agreement with the schools of Ames and adjoining towns, students who expect to teach have the privilege of teaching classes in the elementary and secondary schools. This work is under the direct supervision of the Home Economics Education Department.

GRADUATE WORK. Major work for the degree of Master of Science is offered in all departments. Major work for the degree of Doctor of Philosophy is offered in the department of Foods and Nutrition.

OPPORTUNITIES FOR HOME ECONOMICS GRADUATES. Home Economics graduates of Iowa State College are in demand as state supervisors, teachers of secondary schools and colleges, specialists in extension service, home demonstration agents, dietitians, institutional managers, home service directors for public utility companies, research workers, techni-

cians in commercial laboratories, workers in retail clothing and house furnishing departments, and members of editorial staffs of magazines and newspapers.

PLACEMENT SERVICE. The Home Economics Division through its placement office, endeavors to find positions for all graduates but those desiring to teach in high schools. This group is served by the placement office of the Vocational Education Department. The service is also extended to alumnae who wish to make changes in positions and to undergraduates needing employment through summer vacations.

OMICRON NU. Gamma chapter of Omicron Nu, a national honor society, was installed at Iowa State College in 1913. The object of the organization is to recognize and promote scholarship, leadership, and research among the students in Home Economics. Members are chosen from the upper one-fourth of the senior class and the upper one-fifth of the junior class. Fifteen per cent of those having senior rating and five per cent of those having junior rating may be selected.

PHI UPSILON OMICRON. Omicron chapter of Phi Upsilon Omicron, a national honorary professional fraternity, was installed at Iowa State College in 1926. This organization recognizes potential ability, promotes scholarship, and stimulates interest in Home Economics movements locally and nationally. Members are chosen from the upper two-fifths of the sophomore, junior, and senior classes.

DELTA PHI DELTA. Omicron chapter of Delta Phi Delta, a national honorary professional fraternity, was installed at Iowa State College in 1928. The object of the organization is to promote art interests among college students, to stimulate higher scholarship, and to recognize potential ability. Members are chosen from junior or senior students majoring in Applied Arts who have good scholastic averages in general subjects and high scholastic averages in art subjects.

THE HOME ECONOMICS CLUB. This club, to which all students of the Division are eligible, furnishes a forum for the discussion of subjects of general interest in Home Economics. It arranges for lectures by speakers of national reputation. It is in charge of the annual freshman party given in the Fall Quarter, and assumes major responsibility for the Open House which is an important feature of the all-college three-day celebration held in the Spring Quarter. The club maintains the Catherine MacKay loan fund and sends delegates to the annual convention of the American Home Economics Association.

THE MARY F. RAUSCH PRIZE. This prize is offered to the junior Home Economics student having the best record in scholarship, character, and initiative.

LOAN FUNDS. The Catherine MacKay and the Frances A. Shelden memorial loan funds give assistance to worthy students in the Home Economics Division. The Julia McCulloch Smith loan is available to senior women preferably in the departments of Foods and Nutrition and Home Economics Education.

PUBLICATION. The Iowa Homemaker, a monthly magazine, is published by the students of the division interested in preparing for editorial work in the field of Home Economics.

Division of Industrial Science

DEAN FRILEY, Central Building, Room 111

FUNCTIONS. The Division has two major functions:

1. To offer carefully planned curricula in the biological, physical, and social sciences, with particular emphasis upon the applications of these sciences to industry and commerce, and to the problems of present-day civilization.

2. To provide thorough instruction in the basic sciences and the general studies which form an essential part of the technical and professional curricula offered in the other Divisions of the College.

ORGANIZATION. The Division of Industrial Science includes the following departments of instruction: Bacteriology, Botany, Chemistry, Economics and Sociology, English, Geology, History and Government, Hygiene, Library, Mathematics, Military Science and Tactics, Modern Languages, Music, Physical Education for Men, Physics, Psychology, Public Speaking, Religious Education, and Zoology and Entomology.

FACULTY. The faculty of the Division is made up of the following:

1. Members of all Departments within the Division.
2. Members of the Departments of Veterinary Anatomy, Veterinary Pathology, and Veterinary Physiology, administered in the Division of Veterinary Medicine.
3. Designated representatives from other Divisions.

CURRICULA. The Division of Industrial Science offers the following curricula, which are fully described on the pages indicated.

INDUSTRIAL SCIENCE. See page 226.

GENERAL SCIENCE. See page 228.

CHEMICAL TECHNOLOGY. See page 147.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY. See page 104. (Administered jointly by the Division of Agriculture and the Division of Industrial Science.

INDUSTRIAL SCIENCE AND VETERINARY MEDICINE (SIX YEARS). See page 231.

These curricula lead to the degree of Bachelor of Science; in the curriculum in Industrial Science and Veterinary Medicine, the degree of Bachelor of Science is awarded at the end of the fourth year, and the degree of Doctor of Veterinary Medicine upon the completion of the sixth year.

PREPARATION FOR MEDICINE AND LAW. In connection with the curriculum in Industrial Science, special programs are offered for those who wish

to prepare for the study of law, medicine, or veterinary medicine. See pages 229, 230.

GRADUATE STUDY. Through the Graduate College the degrees of Master of Science and Doctor of Philosophy are awarded in certain fields of the biological sciences, the physical sciences, and the social sciences. For details, see the description of the work of the Graduate College, page 74.

OPPORTUNITIES FOR GRADUATES IN INDUSTRIAL SCIENCE. The remarkable development of the sciences in the last half-century, and the extensive applications of these sciences to present day industry and commerce, and to the economic and social aspects of modern life, have resulted in an increasing demand for scientists and technicians in industry, and for teachers and investigators of science. It is generally believed that scientific development in the next fifty years will be far greater than that of the past, with correspondingly wider opportunities for adequately trained young men and women.

An illustrated booklet, "The Sciences at Iowa State College," describing in detail the opportunities in each of the major scientific fields, may be secured by writing to the Registrar of the College.

PERSONNEL SERVICE. Through its Personnel Office the Division of Industrial Science keeps in close contact with those industries, commercial organizations, and other fields of activity that require the services of young men and women trained in the sciences, and assists in securing positions for properly qualified graduates. This service is available to the members of each graduating class, and to graduates of earlier years who desire to enter new lines of work.

HONORS AND HONOR SOCIETIES. Scholarship holds a high place in Iowa State College, and appropriate honors are bestowed upon students whose academic records are outstanding. In addition to prizes and letters, there are many honor organizations for admission to which high scholarship is a prerequisite. Among those open to students in the Division of Industrial Science are the following.

Phi Lambda Upsilon	Chemistry	Men
Iota Sigma Pi	Chemistry	Women
Imkhorn	English	Men
Chi Delta Phi	English	Women
Delta Sigma Rho	Forsenics	Men and Women
Pi Mu Epsilon	Mathematics	Men and Women
Scabbard and Blade	Military Science	Men
Phi Mu Alpha	Music	Men
Sigma Alpha Iota	Music	Women
Psi Chi	Psychology	Men and Women
Phi Kappa Phi	All-College	Men and Women
Sigma Xi	All-College	Men and Women
Jack O'Lantern	All-College	Women
Mortar Board	All-College	Women
Cardinal Key	All-College	Men

THE INDUSTRIAL SCIENCE COUNCIL is the governing body of the student organizations and activities in the Division of Industrial Science. The

Council which is made up of representatives of both students and faculty, endeavors to bring the various departments of the Division into closer fellowship, and to promote a spirit of loyalty to the Division and to its members. It also represents Industrial Science students in all matters having to do with the welfare of the student body as a whole.

THE SCIENCE WOMEN'S CLUB provides opportunity, through its monthly meetings, for the consideration of matters of common intellectual interest, and sponsors the social activities of the women students in the Division of Industrial Science.

Division of Veterinary Medicine

DEAN STANCE, Veterinary Administration Building, Room 201

The Division of Veterinary Medicine was established in 1879. It is the oldest veterinary college in the United States. It has always been an integral part of the Iowa State College. All staff members are experienced in their respective fields and devote their entire time to their college duties.

The following departments are included in the Division:

The faculty of the Division of Veterinary Medicine consists of the Dean of the Division, the professors at the head of the departments, the associate and assistant professors, and instructors in the departments. Representatives of departments outside of the Veterinary Division, in which the veterinary students do a part of their work, are considered members of the veterinary faculty.

The Division offers the following curricula:

The course of instruction extends over four years and is designed for the professional training in veterinary medicine of those who have made the necessary preparation in some recognized high school and college. (See entrance requirements.) While one year of college work is the minimum entrance requirement at present, students are urged to complete two years. A reading knowledge of French and German and training in physics will be found to be of great assistance in solving many of the problems confronting the veterinary student.

With one year of college pre-veterinary work it has been possible to arrange group electives in the senior year to the extent of 8 credit hours each quarter. While the student is not encouraged to "specialize," the curriculum does offer an opportunity to devote additional time to subject groups in which the student may be interested. Detailed arrangements will be made with the head of the department in which the major subject is taught.

The four-year curriculum leads to the degree of Doctor of Veterinary Medicine, and the combined six-year curriculum with the Division of Industrial Science, leads to both B.Sc. and D.V.M. degrees.

Aside from the strictly educational departments in the Division, there is also the Department of Veterinary Research, which gives the student rare opportunity to observe those phases of veterinary science in which this department is engaged.

The equipment for instruction in Animal Husbandry, consisting of large flocks and herds of carefully selected breeds of livestock, is of the best and helps to render practical instruction very efficient. The most perfect types of the different breeds are used for class work. In this way the work in Veterinary Medicine is linked with that in Agriculture, an arrangement which proves to be of inestimable value to veterinarians.

The fact that the College is located in the center of the richest live-stock country in the world provides a rare opportunity for the veterinary student to study animal industry; it also enables him to observe a wealth of clinical cases both at the Veterinary Hospital, and under general practice conditions.

Work in Chemistry, Biology, and other related sciences is adequately provided for in the special buildings for the acommodation of these several departments of college work. Each branch of study is presented to the student by a specialist.

Candidates for graduation must be twenty-one years of age, of good moral and professional character, and must be approved by all the departments of the Division, to secure the degree of Doctor of Veterinary Medicine.

Graduate College

DEAN BUCHANAN, Central Building, Room 110

HISTORY AND ORGANIZATION

Iowa State College has offered opportunities for graduate work to qualified students since the founding of the institution. The first advanced degree was conferred in 1877. In the earlier years the work of the graduate students was in immediate charge of the departments concerned, under the supervision of the General Faculty. Later each of the five divisional faculties of the College: Agriculture, Engineering, Home Economics, Industrial Science, and Veterinary Medicine, assumed control of the graduate work of the students of the departments administered within the respective divisions. In 1913 a distinct Graduate Faculty was organized, and an executive Graduate Committee appointed. The Graduate Faculty consists of the President, the Dean of the Graduate College, the Deans of the five major divisions, the Librarian, the Registrar, the heads of departments offering major graduate credit, other members of the instructional and research staffs of the institution who are in direct charge of courses offered only to graduate students for major credit, and the examiner of modern languages.

GENERAL STATEMENT

The Iowa State College is a technical institution. Its Graduate College offers to qualified students the opportunity to pursue advanced courses and to undertake research in technology and those branches of science that find their application in industry. No major graduate work is offered in the so-called liberal arts subjects. Most of the technical and scientific departments give courses and direct research leading to the degree of Master of Science. A smaller number offer major work leading to the degree of Doctor of Philosophy. The engineering departments recommend the appropriate professional degrees for those who are qualified by training and experience. Many departments have special requirements for advanced degrees. These are to be regarded as supplementing the general rules.

The immediate aims of graduate study differ from those of undergraduate study. The graduate student should seek to develop the power of independent work, to become imbued with the true spirit of research, to specialize without becoming narrow. He is expected to read widely in those fields related to his major work, and to become familiar with the workers actively engaged in productive research. The Master's and Doctor's examinations, particularly the latter, should show a wide acquaintance with the literature of the subjects of his major and minor departments.

ADMISSION

Admission to the Graduate College for the purpose of pursuing advanced work is prerequisite to admission to candidacy for a degree.

I. Application and Transcript of Record. Before the prospective graduate student can be classified he must fill out application blanks for admission to the Graduate College. These may be secured either from the Registrar or the Dean of the Graduate College. When filled out, the blanks are presented or forwarded to the Dean of the Graduate College. There should be filed at the same time a complete official transcript of all previous educational work, including high school credits. If the application is approved, an admission card admitting the student to the Graduate College is sent by the Registrar to the Dean of the Graduate College. In exceptional cases the Registrar may issue a provisional admission card good for ten days, pending receipt of transcript of record.

II. Qualifications. To be admitted to the Graduate College the prospective student must be a graduate of an institution whose requirements for the Bachelor's degree are substantially equivalent to those of the Iowa State College. Scholastically, the applicant must be in the upper 50 per cent of the class in which he was graduated.

A. Unrestricted Admission.

Graduates of institutions on the approved list of the Association of American Universities will be admitted to the Graduate College provided the departmental requirements for the proposed major fields have been met.

B. Provisional Admission.

1. Graduates of institutions not on the approved list of the Association of American Universities but upon lists of recognized regional accrediting associations will be admitted provisionally to the Graduate College provided also that the departmental requirements for the major fields have been met. The qualifications and accomplishments of students thus provisionally admitted will be reviewed at the end of one quarter in residence and the status of the student determined by the Graduate Committee. In general, graduates of recognized foreign universities will be admitted in accordance with the provisions of this paragraph.

2. Graduates of institutions accredited by recognized regional associations as "Institutions Primarily for the Training of Teachers" who plan to take major work in home economics education, vocational education, or industrial arts education, may be admitted provisionally. They will not ordinarily be admitted to graduate standing with major in other fields.

3. Graduates of institutions not on the approved list of the Association of American Universities nor of the recognized regional accrediting associations are in general not eligible for admission to the Graduate College. Exception may be made by the Graduate Committee provided the prospective candidate has passed special examinations covering preparation in the proposed major and related fields and such other tests as may be set. Students admitted under this provision may qualify

for unconditional admission only after completion of one quarter's successful work and upon review of all circumstances and approval by the major department and the Graduate Committee.

In general the applicant must show such preparation for his major work as should enable him to proceed to the degree of Master of Science in not more than six quarters, provided a full schedule is carried.

REGISTRATION AND CLASSIFICATION

After matriculation, the student will register and classify in accordance with the following regulations:

a. CONSULTATION. If there are questions concerning work which the student desires to clear up before classification, he should consult the head of the department in which he is to take his major work, or the Dean of the Graduate College. Classification for residence work is completed as follows:

b. PAYMENT OF FEES. Payment of the registration fee is made at the office of the Treasurer.

c. PRELIMINARY CLASSIFICATION. Classification is initiated by outlining the curriculum for the quarter in consultation with the person in charge of the major work. If the major department is not chosen, the Dean of the Graduate College shall be in charge. Time Cards will be found in the offices of the heads of departments or in the office of the Dean of the Graduate College. These Time Cards are signed by the person or persons in charge of the major work and by the head of the department in which the major work is taken. These faculty members together with those in charge of the minor work constitute the student's advisory committee, and have general supervision over his graduate work.

d. CLASSIFICATION WITH THE DEAN. Classification is completed by filing in the office of the Dean of the Graduate College the admission card (upon first classification only), the Dean's directory and statistical cards (secured at the time of payment of registration fee), and upon approval by the Dean, the Time Cards showing the curriculum outlined. The Dean of the Graduate College retains one of these Time Cards and sends one to the head of the major department and one to the Registrar.

e. CHANGES IN CLASSIFICATION. Changes in classification are made only upon filing in duplicate a "change in Graduate College classification" sheet, and upon approval of the Dean.

f. CHOICE OF COURSES. Courses chosen for graduate credit must be from among those listed as giving such credit in the Graduate Catalogue. Other courses may be taken as supporting courses but not credited toward an advanced degree.

g. CREDITS. Classification in courses carrying full graduate credit is ordinarily limited to a maximum of fifteen credits per quarter. Exceptions to this rule must have the specific approval of the Dean. It is expected that all graduate work for the completion of an advanced degree shall be completed within a term of five years. Only in exceptional cases, upon recommendation of the department concerned and approval

by the Graduate Committee, will credit be allowed in courses taken over a period of more than five years.

Graduate students (even though course and residence requirements have been met) must register in any quarter in which the facilities of the institution are being used in preparation of thesis or for examination.

h. VISITOR'S PERMITS. Permits to attend classes as auditor are secured by indicating on the classification sheets under "supporting courses" and marked "visitor." This should have the approval of the head of the department in which the major work is taken and the Dean of the Graduate College. Permits are issued by the Registrar.

CLASSIFICATION IN ABSENTIA

Graduate credit is not allowed for correspondence courses. In exceptional cases permission may be granted to students who have been in residence in the Graduate College to do a limited amount of work *in absentia*. The total credit thus obtained cannot exceed that previously gained in residence. Credit thus obtained will not be counted as residence credit. The cases where this is allowed are confined practically to research problems, such as agricultural surveys, and ecological surveys in botany and zoology, which can best be carried on in the field under the supervision of the student's major department. Permission to classify *in absentia* must be given by the head of the student's major department and approved by the Dean of the Graduate College. Classification *in absentia* is completed as follows.

a. PRELIMINARY CLASSIFICATION. Standard time cards listing the research courses in which the student is to be classified are signed in triplicate (or quadruplicate) by the individual under whom the major work is taken and the head of the major department, then forwarded to the Dean of the Graduate College. These should be marked plainly, "*In Absentia.*"

b. PAYMENT OF FEES. The student will forward the required fee of $1.00 per credit hour to the Dean of the Graduate College. This fee will be paid to the Treasurer of the College, who will issue the registration card to the Dean.

c. REPETITION OF CLASSIFICATION. One classification and registration only will be required during any single school year, except in case of change of classification.

INTERIM CLASSIFICATION

Graduate students who are in residence during periods between the closing and opening of the regular quarters of the academic year may upon special permission, register for graduate work under the regular members of the instructional staff who are in residence. Students may register in not to exceed one credit per week. Fee for such classification will be $3 per credit hour.

FEES AND EXPENSES

For Fall, Winter, Spring, see page 45.
For Summer Session, see page 298.

DEGREES

The higher degrees conferred by the Iowa State College are Master of Science, and Doctor of Philosophy; the professional degrees are Agricultural Engineer (A.E.), Architectural Engineer (Arch.E.), Ceramic Engineer (Cer.E.), Chemical Engineer (Ch.E.), Civil Engineer (C.E.), Electrical Engineer (E.E.), Engineer of Mines (E.M.), Industrial Engineer (I.E.), Mechanical Engineer (M.E.).

REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

The requirements of paragraphs 1 to 11 inclusive below must be met by all candidates for the degree of Master of Science. In exceptional cases men who are properly qualified may pursue work toward the degrees of Master of Science and Doctor of Veterinary Medicine coincidently in accordance with paragraph 12 below.

1. RESIDENCE. At least three quarters or a minimum of thirty weeks must be spent in resident graduate work.

Not more than one-fourth of the residence requirement may be satisfied in certain departments by attending Saturday classes.

Arrangements have been made whereby graduate students in certain departments may earn a portion of their resident credit at the State University of Iowa.

2. CREDITS. At least forty-five hours of creditable graduate work must be completed, not less than four-fifths of which must be taken in residence at this institution.

3. DISTRIBUTION OF CREDITS BETWEEN MAJOR AND MINOR. A minimum of thirty credit hours shall be completed in the major work. Minor work is usually required; it may be taken in the same department as the major, but in a distinct subdivision of that department. The exact number of credit hours in minor work is not prescribed.

4. JOINT MAJOR. Major work may, upon special recommendation of the departments concerned and approval of the Dean, be taken in two closely related departments. In such cases a minor is optional.

5. MODERN LANGUAGE. Except where specifically waived in the description of requirements of the student's major department in the Graduate Catalogue, a satisfactory reading knowledge of French or German must be certified by the Head of the Department of Modern Languages prior to admission to candidacy. In special cases, upon recommendation of the head of the department in which the major work is taken, and approval of the Dean, some other foreign language of particular value to the work of the candidate may be substituted for French or German.

Students who are unable at the time of their admission to meet the foreign language requirement in the department in which the major work is taken should not ordinarily expect to be able to complete the work for the degree of Master of Science in the minimum length of time.

Such students will classify in appropriate courses in modern languages as "Required" (R) without designation of numbers of hours and without credit.

6. GRADUATE COURSES. Credit in major work can be secured only by the completion of courses chosen from the list given in the Graduate Catalogue headed "Open to graduates only. Major or minor," and "Open to graduates and advanced undergraduates. Major or minor." Courses for which minor credit is desired may be chosen from either of the lists mentioned above and from the list headed "Open to graduates for minor only."

Other courses (listed as supporting courses) may be taken but not credited toward an advanced degree.

7. ADVANCEMENT TO CANDIDACY. A student registered in the Graduate College may become a candidate for the degree of Master of Science by conforming to the following regulations:

a. PRELIMINARY RESIDENCE REQUIREMENTS. The student must have been registered in the Graduate College for at least one quarter.

b. APPLICATION. A blank form requesting admission to candidacy may be secured from the office of the Dean. This application must be approved and signed by the head of the department in which the major subject is offered, by the person in charge of the major, and must include certification that all modern language and English requirements have been met. Final approval of the candidacy will be determined by the Graduate Committee.

c. WHEN COMPLETED. Candidacy must be completed and approved at least one quarter or term before the conferring of the Master's degree.

8. EXAMINATION. Final examination shall be taken on all graduate work including thesis. This examination shall be in charge of the student's advisory committee. It will ordinarily be oral, but may be written in whole or in part as determined by the committee in charge. The purpose of this examination is to determine the candidate's general fitness and preparation. This examination shall be held at such time and place as are appointed by the Dean, and shall be completed at least one week prior to the close of the quarter in which the degree is to be granted.

The report of the examination after it has been signed by all the members of the committee will be forwarded promptly to the Dean of the Graduate College.

9. THESIS. Thesis is required by all departments. Joint theses are not acceptable. Copies of the completed thesis must be in the hands of the examining committee and the Librarian one week prior to the date fixed for the final examination.

10. DIPLOMA SLIP. A diploma slip (obtained at the office of the Dean

of the Graduate College) must be filled out and returned before the middle of the quarter in which the student expects to take his degree.

11. O. K. Slip. Upon completion of other requirements, the candidate will secure from the office of the Registrar an "O. K. slip." This must be filled out completely and returned to the Registrar by the date indicated thereon.

12. Special Regulations for Students of Veterinary Medicine. Specially qualified graduates in scientific curricula, when the request has been approved by the Dean of Veterinary Medicine and the Dean of the Graduate College, may pursue work coincidently toward the degrees of Master of Science and Doctor of Veterinary Medicine. The major graduate work of such student must be completed in courses not required in the undergraduate curriculum in Veterinary Medicine. A student taking advantage of this opportunity will classify both with the Dean of Veterinary Medicine and the Dean of the Graduate College.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

The primary requirements for the degree of Doctor of Philosophy are three: (1) High attainment and proficiency of the candidate in his chosen field, (2) The development of a thesis which shall be a real contribution to knowledge and which shall show power of independent and creative thought and work, and (3) The successful passing of examinations over the field of the candidate's major work in detail, with a satisfactory showing of his preparation in related and minor courses.

Upon admission of the graduate student to work looking toward the degree of Doctor of Philosophy, the Dean of the Graduate College will appoint a committee of the Graduate Faculty to be in charge of his work. This committee shall consist of the following: The faculty member who will be in charge of the major research (chairman), representatives of the departments in which both major and minor work is to be taken, and such other representatives of the Graduate Faculty as may be appointed by the Dean. This committee shall file with the Dean of the Graduate College at least one quarter in advance of the preliminary examination, an outline of the curriculum to be pursued by the student.

The degree of Doctor of Philosophy may be conferred upon candidates who have met the following requirements:

1. Residence. A minimum of three years in graduate study, of which one-half at least is to be in residence, except that in special cases the residence requirement at this institution may be reduced to one year. The degree will be conferred not solely as a result of faithful study over any period, but for research work of a scholarly character, and the successful passing of all examinations.

2. Major and Minor Work. Major work shall be taken in one department or subdivision of a department, or, in exceptional cases, in two closely related subjects. A first and second minor shall be chosen, or one minor only if the major is divided. The total minor work should represent from one-fourth to one-third of the work for the degree. One of

the minors shall be taken in a separate department from that in which the major is taken.

3. MODERN LANGUAGES. A satisfactory reading knowledge of French and German must be certified by the Head of the Department of Modern Languages before application is made for preliminary examination. In special cases, upon recommendation of the head of the department in which the major work is taken, and approval of the Graduate Committee, another language may be substituted for either French or German.

4. GRADUATE COURSES. Credit in major work can be secured only by the completion of courses chosen from the lists headed "Open to graduates only. Major or minor," and "Open to graduates and advanced undergraduates. Major or minor." During the last two years of the graduate work, the courses selected generally should be from the list headed "Open to graduates only. Major or minor." Courses for which minor credit is allowed may be selected from either of the lists mentioned above and from the list headed "Open to graduates for minor only." Supporting courses not allowed for graduate credit are frequently advisable.

5. PRELIMINARY EXAMINATION AND ADVANCEMENT TO CANDIDACY. The student must pass satisfactorily a preliminary examination before admission to candidacy for the degree. It must be passed at least three quarters before the final examination. Exceptions to this rule will be made only upon special recommendation of the student's committee and approval of the Graduate Committee. In no case may the final examination be given in less than six months from the time of the preliminary examination. The dates and places for this examination will be fixed by the Dean upon recommendation of the committee in charge. The examinations are usually both written and oral unless otherwise specifically recommended by the committee. Upon the satisfactory passing of the preliminary examination, the committee will file with the Dean a statement of additional requirements to be met by the student before the final examination and shall recommend admission to candidacy.

The preliminary examination should satisfy the committee as to the student's knowledge of the courses taken in the major and minor fields and any other courses essential or prerequisite to a satisfactory understanding of the major field. An answer to the following queries should be sought. Does the preparation of the student indicate that he has the background, training, and ability necessary to carry on research with a reasonable probability of success? Is the research topic chosen satisfactory and suitable? Has a satisfactory start been made upon it? Does the student have that knowledge of literature of his field and command of English and foreign languages desirable?

6. THESIS. A doctoral dissertation (thesis) shall be completed on some topic connected with the major subject. To be acceptable it must constitute a real contribution to knowledge. Copies of the completed thesis must be in the hands of the examining committee and the Librarian one week prior to the date fixed for the final examination. Two complete and approved typewritten copies of the thesis shall be deposited with the Librarian for binding. Publication of the thesis or an approved abstract thereof is required. The candidate, with the approval of

his committee and the Dean of the Graduate College may choose either one of the following alternatives (a or b) to fulfill the publication requirement.

a. The thesis is to be published, either privately by the candidate or by a standard scientific publication. Publication shall be either in full or in part as determined by the candidate's committee. One hundred copies of the thesis shall be deposited with the Librarian. If the thesis is curtailed or modified in publication, the fact that the complete thesis is on file should be noted on the first page of text or on the title page of the thesis copies deposited. If the published thesis is not available for deposit at the time the degree is sought, the candidate will deposit with the Treasurer the sum of $50.00. This sum will be refunded within 60 days after the deposit of the 100 copies in acceptable form. If the 100 copies are not filed within five years, the sum will revert to the library.

b. An acceptable and approved abstract of the thesis may be filed with the Librarian, and the sum of $5.00 per printed page (400 words) or fraction thereof paid to the Treasurer. This abstract will normally contain at least 1,000 to 1,200 words and the minimum fee is $15.00. The college will thereupon assume the publication of the abstract, and will deposit 100 printed copies with the Librarian.

7. Examination. Final examinations shall be taken on all graduate work including thesis. This examination shall be conducted by the student's advisory graduate committee with such other members of the faculty as may be designated by the Dean. It will be written or oral, or both, as determined by the committee. The examination or examinations shall be held at such times and places as are appointed by the Dean, and shall be completed at least one week prior to the close of the quarter in which the degree is to be granted.

The committee will certify to the Dean of the Graduate College the results of the examination.

8. Diploma Slip. A diploma slip (obtained at the office of the Dean of the Graduate College) must be filled out and returned before the middle of the quarter in which the student expects to take his degree.

9. O. K. Slip. Upon completion of other requirements, the candidate will secure from the office of the Registrar an "O.K. slip." This must be filled out completely and returned to the Registrar by the date indicated thereon.

10. Hoods. Candidates for the degree of Doctor of Philosophy will be required either to purchase or to rent hoods to be used at the time the degree is conferred. Hoods must be secured through the Registrar's office.

PROFESSIONAL DEGREES IN ENGINEERING

The professional degrees in engineering are granted as a recognition of professional standing, development, and attainments. They are granted to those holding degrees in engineering from Iowa State College, upon

compliance with the requirements set forth below. Engineering graduates from institutions of equal standing may be invited by the Engineering Faculty to become candidates for the professional degree on the same basis as graduates of Iowa State College.

The professional degrees in engineering are: Architectural Engineer (Arch.E.), Agricultural Engineer (A. E.), Ceramic Engineer (Cer.E.), Chemical Engineer (Ch.E.), Civil Engineer (C.E.), Electrical Engineer (E.E.), Industrial Engineer (I.E.), Mechanical Engineer (M.E.), Engineer of Mines (E.M.).

The requirements for the professional degrees in engineering are as follows:

1. Baccalaureate Degree. Completion of a standard four-year curriculum in Engineering at Iowa State College leading to a Bachelor's degree usually though not necessarily, corresponding to the professional degree sought.

2. Experience. The candidate must have had five years' experience in a professional position, three of which shall have been in responsible charge of Technical Engineering work. Engineers who hold a Master's degree in Engineering may qualify by three years of responsible charge in a professional position. Membership in a national professional society and possession of a license to practice professional engineering are given consideration in evaluating the qualifications of applicants.

3. Admission to Candidacy. The applicant must be admitted to candidacy at least six months before the degree is sought. Application in writing shall be made to the Dean of Engineering. This application shall contain a complete record of the professional work of the candidate and of his preliminary training, and the title of his thesis. When approved by the Dean of Engineering, and the head of the department in which the degree is sought, and filed with the Dean of the Graduate College, admission to candidacy will be certified by the latter.

4. Thesis. A satisfactory thesis must be completed. The thesis shall give evidence of more than ordinary professional attainment; it may be an engineering study of economics or design, or may be of a research nature. Two copies of the thesis in approved form shall be submitted to the head of the department concerned at least two months before the date of commencement. When approved by the head of this department, the Dean of Engineering, and the Dean of the Graduate College, these copies shall be filed with the Librarian at least two weeks prior to the close of the quarter in which the degree is to be conferred.

5. Faculty Approval. The approval of the Engineering Faculty and of the Graduate Faculty, except that candidates for the degree of Agricultural Engineer shall secure also the approval of the Agricultural Faculty.

6. Presence at Commencement. The candidate must present himself at commencement in order to secure his degree.

FELLOWSHIPS AND SCHOLARSHIPS

Fellowships and scholarships have been established for the encouragement of graduate work and the promotion of research. They are open to graduates of approved colleges who have the requisite undergraduate, and in some cases, graduate preparation. Appointments will be made only from students who ranked in the highest 25 percent of their respective graduating classes. Full graduate credit will be allowed scholars and fellows.

TEACHING SCHOLARSHIPS. Stipend $225 per year. These may be offered by the various departments of the College. Scholars will be expected to teach a minimum of three hours per week in the classroom or six hours per week in the laboratory, or perform equivalent allotted duties for the department granting the scholarship.

TEACHING FELLOWSHIPS. Stipend $450 per year. The scientific and most of the technical departments of the College may each offer one or more teaching fellowships. Fellows will be expected to teach a minimum of five hours per week in classroom or ten to twelve hours per week in the laboratory, or perform equivalent allotted duties for the department granting the fellowship.

RESEARCH FELLOWSHIPS AND SCHOLARSHIPS. Many of the sections of the Agricultural and Engineering Experiment Stations, Industrial Research, the Department of Veterinary Research, and certain college departments may offer research scholarships and fellowships. The stipend for a research scholarship is $225 per year. For a research fellowship the stipend is $450 per year. Appointments to research fellowships are usually restricted to those who have had some graduate training.

Research fellows and scholars are expected to do their major work largely in connection with the experiment station or departmental research work being carried on. It is expected that they shall observe and be on duty during experiment station hours during the term of appointment except for such time as is required for the minor and supporting work.

SPECIAL RESEARCH AND INDUSTRIAL FELLOWSHIPS. Each year several research fellowships are offered either by the College or by other agencies for the study of special industrial problems. The stipend varies with the nature and importance of the work and the preparation of the fellow.

APPLICATION. Application blanks for fellowships and scholarships may be obtained from the office of the Dean of the Graduate College. These blanks, filled out in triplicate, should be returned to that office not later than March 1st. Awards are announced about April 1st.

GRADUATE ASSISTANTSHIPS

Graduate assistantships have been established in many of the college departments for the encouragement of graduate work and the promotion of research. Similar positions have been established in several sections of the Agricultural and Engineering Experiment Stations. These assistantships are open to graduates of approved colleges who have the requi-

site undergraduate, and in some cases, graduate preparation. Appointments will be made only from students who ranked in the highest 25 per cent of their respective graduating classes.

A graduate assistant may enroll in graduate work not to exceed two-thirds of a full schedule (a maximum of eleven credit hours).

A prerequisite to appointment as a graduate assistant is the successful completion of some previous graduate work or evidence of ability successfully to carry on research and to serve the department in which the appointment is made.

A graduate assistant in the college is required to teach in class or laboratory one-half of the standard teaching schedule assigned to an instructor in the department in which he is employed, or perform equivalent allotted duties.

A graduate assistant in the experiment station observes experiment station hours, except for such time as is allowed for minor and supporting graduate work. In general, major graduate work undertaken by such a graduate assistant is connected with research being carried forward by the section in which he is employed.

Appointments to college graduate assistantships are for one college year, beginning on the Tuesday preceding the opening of the Fall Quarter and ending on the day after the corresponding day of the following June. Graduate assistants are eligible to reappointment.

Graduate assistantships pay from $540 to $720 per year, depending upon the character of the work to be done, and special qualifications of the appointee.

Application blanks may be obtained from the office of the Dean of the Graduate College. These blanks, filled out in triplicate, should be returned to that office not later than March 1st. Awards are announced about April 1st.

GRADUATE STUDY BY MEMBERS OF STAFF

Members of Staff on Full Time Employment. Any member of the instructional or extension staffs of the grade of assistant or instructor, subject to the approval of the head of his department, or any member of the investigational staffs of corresponding grade, subject to the approval of the chief of his section, may carry not to exceed five credit hours of graduate work per quarter, provided such does not interfere with his other duties. This privilege may be extended to members of the instructional staff of the grade of assistant professor, or to members of investigational staffs of equivalent grade, upon approval of the Dean concerned and of the President.

Members of Staff on Part Time Employment. All adjustments as to amount of work to be taken for credit by members of the staff on part time shall be fixed at time of employment. In general, one additional credit hour of graduate work may be carried for each diminution by one twelfth from full time employment.

Summer School. Other members of the staff may enroll in graduate work during the Summer Quarter if not on duty and not receiving salary

from the college during this time. If holding the rank of professor or associate professor they cannot become candidates for a degree from this institution.

DEPARTMENTS OF INSTRUCTION

AGRICULTURAL ECONOMICS (For description, See Economics, page 91.)

AGRICULTURAL ENGINEERING

The department offers major work for the degree of Master of Science in drainage and irrigation, farm machinery, farm power, and farm structures; and minor work to students taking major work in other departments. The department certifies for the professional degree of Agricultural Engineer.

Prerequisite to major graduate work is the completion of an undergraduate curriculum in agricultural engineering substantially equivalent to that required of undergraduate students at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 112.
Open to graduates for minor only. 324, 345, 346, 375, 420, 425, 427, 428, 447, 476, 487.
Open to graduates and advanced undergraduates. Major or minor. 528, 536, 546, 577, 587.
Open to graduates only. Major or minor. 609, 628, 636, 646, 661, 662, 663, 677, 687.

AGRICULTURE

The department offers minor work to students taking major work in other departments.

For description of courses, see page 117.
Open to graduates for minor only. 404.

AGRONOMY

The department offers major work for the degree of Master of Science in crop production, crop breeding, soil physics, soil fertility, soil bacteriology, and soil management; major work leading to the degree of Doctor of Philosophy in soil fertility, soil bacteriology, soil physics, and crop breeding; and minor work to students taking major work in other departments.

Prerequisite to major graduate work in the department is the completion of undergraduate work substantially equivalent to that required of undergraduate students in the curriculum in agronomy at this institution. Students in farm crops should have had at least the equivalent of one year's work in farm crops, one course in general botany, courses in general agriculture and general science, special work in soils and usually advanced courses in farm crops. Students in soils should have had at least the equivalent of one year's work in soils and in chemistry, a

course in bacteriology, courses in general agriculture and general science, and usually advanced courses in soils.

Students taking major work in farm crops will usually minor in soils, genetics, or botany, especially in plant physiology, or plant pathology. Students taking major work in soils will usually minor in chemistry, farm crops, botany, bacteriology, agricultural engineering, or geology.

For students wishing to minor in agronomy the following courses are suggested: Farm Crops 414, 504, 606; Soils 554, 664, 674, and 684.

For description of courses, see page 119.

Open to graduates for minor only.
Farm Crops. 304, 305, 410, 414, 424, 445.
Soils. 374, 454, 464, 474.

Open to graduates and advanced undergraduates. Major or minor.
Farm Crops. 504, 546.
Soils. 554, 564.

Open to graduates only. Major or minor.
Farm Crops. 604, 605, 606, 640, 645.
Soils. 654, 664, 674, 684, 690, 695.

ANIMAL HUSBANDRY

The department offers major work for the degree of Master of Science in animal nutrition, animal production, animal breeding, meats, dairy husbandry, and poultry husbandry (poultry breeding and poultry nutrition); major work for the degree of Doctor of Philosophy in animal breeding and animal nutrition, dairy husbandry, and poultry husbandry (poultry breeding and poultry nutrition); and minor work to students taking major work in other departments.

The fields of major work listed above will include courses listed in other departments when such courses are appropriate to the student's previous training, major interests, and thesis problem. Thus, those taking major work in all the above fields will often include courses in mathematics (statistical methods); those taking major work in animal and poultry breeding will include courses in genetics and zoology; and those taking major work in animal and poultry nutrition will include courses in physiology, chemistry, etc.

Prerequisite to major graduate work is the completion of an undergraduate curriculum in animal husbandry, dairy husbandry, or poultry husbandry, substantially equivalent to one of those required of undergraduate students at this institution and should include prerequisite undergraduate courses necessary for the particular line chosen. The student should have a general knowledge of zoology, and chemistry (both inorganic and organic).

For description of courses, see page 126.

Open to graduates for minor only. 318, 335, 350, 409, 410, 424, 425, 427, 429, 460, 475.

Open to graduates and advanced undergraduates. Major or minor. 535, 536, 541, 542, 543, 546, 548.

Open to graduates only. Major or minor 600, 605, 614, 615, 630, 638, 640, 650, 651, 652, 653, 670, 680.

APPLIED ART

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of undergraduate work in applied art substantially equivalent to that required in the undergraduate curriculum in applied art at this institution.

For description of courses, see page 196.
Open to graduates for minor only. 305, 434, 445.
Open to graduates and advanced undergraduates. Major or minor 504, 507, 524, 535, 546, 547, 565, 566, 585, 586.
Open to graduates only. Major or minor. 604, 614

ARCHITECTURAL ENGINEERING

The department offers major work for the degree of Master of Science in architectural engineering, and minor work to students taking major work in other departments. The department certifies for the professional degree of Architectural Engineer.

Prerequisite to major graduate work is the completion of a standard curriculum in architectural engineering substantially equivalent to that required of undergraduates at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 130
Open to graduates for minor only. 491, 492, 493, 494.
Open to graduates only Major or minor. 600, 604.

BACTERIOLOGY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in physiological, systematic, soil, dairy, veterinary, sanitary, and household bacteriology; and minor work to students taking major work in other departments.

Specific prerequisite to major graduate work in bacteriology is the completion of at least one thorough course in general bacteriology, chemistry (including inorganic and organic), and physics. Physiological and bio-physical chemistry are advised. Students taking major work in soil bacteriology should have completed courses in soils substantially equivalent to those required of undergraduates in the curriculum in farm crops and soils at this institution. Students taking major work in dairy bacteriology should have completed courses in dairy industry substantially equivalent to those required of undergraduate students in dairy industry at this institution.

Minor work is recommended in veterinary pathology and histology; physiological, bio-physical, organic, and sanitary chemistry; plant physiology and pathology; soils, dairy industry, or foods and nutrition.

For description of courses, see page 133.
Open to graduates for minor only. 350, 450
Open to graduates and advanced undergraduates Major or minor 534, 535, 536, 537, 554, 555, 556, 557, 560, 561, 562, 563, 564, 571, 572, 573, 574, 575
Open to graduates only Major or minor. 631, 632, 633, 655, 656, 674, 690, 695A

BOTANY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in ecology, morphology, mycology, pathology,

physiology, and systematic and economic botany; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least thirty undergraduate credit hours in botany. In certain cases undergraduate courses in bacteriology, farm crops, or horticulture may be in part substituted for botany. Students desiring to take major work in plant physiology should present undergraduate credits in inorganic and organic chemistry, and if practicable in physiological chemistry. Students desiring to take major work in plant pathology should present undergraduate credits in bacteriology, organic chemistry, and whenever practicable in either horticulture or farm crops. Students desiring to take major work in systematic botany should have prerequisites in general morphology.

Students with major in botany will usually select their minor from one of the following: bacteriology, physiological and bio-physical chemistry, physics, zoology and entomology, genetics, farm crops, horticulture, forestry, or geology.

For description of courses, see page 135

Open to graduates for minor only. 404, 405, 406, 414, 415, 416, 424, 445, 455, 494

Open to graduates and advanced undergraduates. Major or minor. 505, 546, 554, 555, 556, 557, 559, 564, 565, 566, 571, 572, 573, 574, 575, 576, 584, 585, 594, 595, 596, 597, 598, 599.

Open to graduates only. Major or minor 605, 606, 611, 612, 613, 617, 618, 634, 635, 636, 641, 642, 643, 644, 654, 695.

CERAMIC ENGINEERING

The department offers major work for the degree of Master of Science in ceramic engineering, and minor work to students taking major work in other departments. The department certifies for the professional degree of Ceramic Engineer.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in ceramic engineering or chemical engineering at this institution.

For description of courses, see page 141.

Open to graduates for minor only. 416, 427

Open to graduates only. Major or minor. 601, 602, 603, 608.

CHEMICAL AND MINING ENGINEERING

The department offers major work for the degrees of Master of Science in chemical engineering and mining engineering; and Doctor of Philosophy in chemical engineering; and minor work to students taking major work in other departments. The department certifies for the professional degrees of Chemical Engineer and Engineer of Mines.

Prerequisite to major graduate work is the completion of a satisfactory undergraduate curriculum in chemical engineering substantially equivalent to that offered at this institution. Students who cannot qualify for major graduate work in chemical engineering on the basis of exact conformity to the above regulation, may enroll in graduate work in conformity with the provisions listed on page 75, section II-B-3.

Minor work will usually be selected from chemistry, mechanical engi-

neering, civil engineering, electrical engineering, ceramic engineering, mathematics, mineralogy, physics, economics, geology, or bacteriology.

For description of courses, see page 145.
Open to graduates for minor only.
Chemical Engineering. 351, 352, 353, 411, 412, 413, 421, 422, 423, 441, 442, 443, 471, 472, 473.
Mining Engineering. 351, 352, 353, 415, 417.
Open to graduates and advanced undergraduates. Major or minor.
Chemical Engineering. 586.
Mining Engineering. 561, 562, 563.
Open to graduates only. Major or minor.
Chemical Engineering. 600, 610, 614, 615, 616, 620, 621, 622, 623, 651, 652, 653, 671, 672, 673.
Mining Engineering. 600.

CHEMISTRY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in analytical, inorganic, physical, organic, food, sanitary, textile, soil, plant, enzyme, physiological, nutritional, dairy, bio-physical, and special agricultural chemistry; and minor work in these fields and in biochemistry to students taking major work in other departments.

Prerequisite to major graduate work is the completion of undergraduate work in chemistry, mathematics, and physics, substantially equivalent to that required of undergraduate students at this institution whose major is in chemical technology.

For description of courses, see page 149.
Open to graduates for minor only. 314, 321, 322, 323, 345, 346, 347, 348, 411, 412, 427, 431, 432, 433, 441, 442, 443, 466, 474, 495.
Open to graduates and advanced undergraduates. Major or minor.
511, 512, 513, 514, 515, 516, 518, 521, 522, 523, 525, 526, 531, 532, 533, 535, 536, 537, 545, 565, 571, 572, 573, 574, 575, 576, 584, 585, 586.
Open to graduates only. Major or minor. 601, 602, 603, 605, 606, 616, 617, 625, 631, 632, 633, 655, 656, 658, 659, 671, 672, 673, 686, 687, 688, 695.

CHILD DEVELOPMENT

The department offers major work for the degree of Master of Science in child development, and minor work to students taking major work in other departments. Work on the graduate level in this department is under the supervision of the Director of the Iowa Child Welfare Research Station of the State University of Iowa.

Students desiring to major in child development must meet the prerequisites for courses giving graduate credit, and must present 35 undergraduate quarter credits in home economics (including foods and nutrition, applied art, textiles and clothing, and child care and training), and 6 credits in psychology (general and child psychology).

For description of courses, see page 198.
Open to graduates for minor only. 440.
Open to graduates and advanced undergraduates. Major or minor. 536, 545, 550, 555.
Open to graduates only. Major or minor. 614, 665, 666, 667.

CIVIL ENGINEERING

The department offers major work for the degree of Master of Science in all of the principal subdivisions of civil engineering such as sanitary, structural, municipal, highway, railway, and transportation engineering; and major work for the degree of Doctor of Philosophy in structural, sanitary, and highway engineering; and minor work to students taking major work in other departments. The department certifies for the professional degree of Civil Engineer.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in civil engineering at this institution, and should include prerequisite undergraduate courses necessary for the particular line chosen.

Students who major in civil engineering will usually select minor work from the departments of mathematics, physics, chemistry, bacteriology, geology, economics, or other engineering departments.

For description of courses, see page 156.

Open to graduates for minor only. 335, 336, 354, 355, 356, 364, 404, 405, 414, 415, 416, 417, 418, 419, 436, 437, 438, 439, 444, 445, 456, 466, 477, 485, 490.

Open to graduates only. Major or minor. 604, 605, 606, 607, 608, 614, 615, 616, 617, 634, 635, 636, 637, 638, 639, 644, 645, 650, 654, 655, 656, 657, 658, 659, 664, 674, 677, 679, 690.

DAIRY INDUSTRY

The department offers major work for the degree of Master of Science in dairy plant management, dairy bacteriology, dairy chemistry, and manufacture of dairy products; major work for the degree of Doctor of Philosophy in dairy bacteriology; and minor work to students taking major work in other departments.

Students expecting to major in dairy industry should have undergraduate training substantially equivalent to that required of undergraduate students in the curriculum in dairy industry at this institution.

For description of courses, see page 165.

Open to graduates for minor only. 304, 305, 306, 307, 308, 309, 350, 404, 450.

Open to graduates and advanced undergraduates. Major or minor. 504, 505, 506, 507, 508, 554, 555, 556, 557.

Open to graduates only. Major or minor. 600, 604, 605, 606, 607, 608, 609, 625, 650, 655, 656, 660, 690C.

ECONOMICS AND SOCIOLOGY

The department offers major work for the degree of Master of Science in agricultural economics, industrial economics, consumption economics, and rural sociology; major work for the degree of Doctor of Philosophy in agricultural economics; and minor work to students taking major work in other departments.

Students desiring to major in agricultural economics, industrial economics, consumption economics, and rural sociology must present at least thirty undergraduate quarter-credit hours in this general field, nine of which may be in economic history. Those desiring to major in agricultural economics and rural sociology should present additional credits in agriculture.

Each student taking major work in agricultural economics, industrial

economics, consumption economics, or rural sociology, before being admitted to candidacy for an advanced degree, must show proficiency in economic theory, finance, and statistics and at least one of the following: sociology or accounting. It is assumed that a part of this work will have been covered in undergraduate courses, and that the balance will be carried as graduate work in addition to work in the field of his major choice in which his thesis shall be chosen. Graduate work in one or more of these lines shall be construed to satisfy the requirement of a minor. Arrangements are made for such students as wish to select a minor outside of the department.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 167

Open to graduates for minor only 304, 374, 375, 376, 396, 406, 438, 470, 474, 484.

Open to graduates and advanced undergraduates. Major or minor. 500, 504, 505, 507, 508, 510, 514, 515, 516, 517, 518, 530, 534, 535, 536, 537, 538, 539, 540, 545, 546, 547, 550, 560, 564, 568, 575, 576, 580, 585, 586, 587, 588, 599.

Open to graduates only. Major or minor. 604, 605, 606, 631, 632, 633, 634, 641, 642, 643, 650, 699.

ELECTRICAL ENGINEERING

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in electrical engineering, and minor work to students taking major work in other departments. The department certifies for the professional degree of Electrical Engineer.

Minor work for the degree of Doctor of Philosophy is limited to mathematics, physics, physical chemistry, and chemical engineering.

Prerequisite to major graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of undergraduate students in electrical engineering at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department, but a reading knowledge of either French or German is strongly urged.

For description of courses, see page 173.

Open to graduates for minor only. 331, 332, 333, 441, 442, 445, 446, 451, 452, 453, 476, 488, 489

Open to graduates and advanced undergraduates. Major or minor 595.

Open to graduates only Major or minor. 600, 614, 626, 628, 636, 637, 646, 647, 650, 654, 656.

ENGINEERING

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in engineering valuation, and minor work to students taking major work in other departments. The department certifies for the professional degree of Industrial Engineer.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution, and should include the prerequisite undergraduate courses necessary for the particular line chosen.

For description of courses, see page 175

Open to graduates for minor only. 354, 405, 406, 407, 416, 417, 425.

Open to graduates only. Major or minor. 604, 605, 606, 694.

FARM CROPS (For description, see Agronomy, page 86.)

FOODS AND NUTRITION

The department offers major work for the degree of Master of Science in foods and nutrition; major work for the degree of Doctor of Philosophy in nutrition; and minor work to students taking major work in other departments.

Prerequisite to major graduate work in foods or nutrition is the completion of at least 50 quarter credit hours of undergraduate work which should include courses in food preparation, dietetics, physics, general biology, human physiology, bacteriology, and chemistry (general, organic, physiological, and quantitative methods). Students desiring to take major work in foods should present in addition, if possible, undergraduate credits in experimental cookery. It is recommended that in addition to the courses specified the student should have a general background in home economics, although students well trained in the fundamental sciences may qualify.

Students taking major work in foods will usually select their minors from economics, food chemistry, colloidal chemistry, or bacteriology. Students taking major work in nutrition for the degree of Doctor of Philosophy will usually select their minors from economics, physiological chemistry, nutritional chemistry, or physiology.

For description of courses, see page 202

Open to graduates for minor only. 305, 404.

Open to graduates and advanced undergraduates. Major or minor 504, 505, 506, 507, 511, 512, 513, 518.

Open to graduates only Major or minor. 604, 605, 609, 614

FORESTRY

The department offers major work for the degree of Master of Science in forest management, forest products and marketing; and minor work to students taking major work in other departments.

Students desiring to major in this department should present forestry credits substantially equivalent to those required of undergraduate students at this institution.

Minor work is usually recommended in botany, particularly plant pathology, agrostology, ecology, dendrology, or plant physiology, entomology, chemistry, soils, landscape architecture, economics, or zoology.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 183.

Open to graduates for minor only. 301, 302, 303, 388, 396, 397, 398, 438, 470, 494, 495, 496

Open to graduates and advanced undergraduates. Major or minor. 506

Open to graduates only. Major or minor. 600, 604, 606, 634, 688, 689, 694, 697.

GENETICS

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in genetics; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a thorough undergraduate curriculum in agriculture, or preferably in a biological science, which should include one year's work in botany and in zoology, mathematics (including statistics), chemistry, and foreign language (preferably German). In the biological sciences, courses in physiology, morphology, and cytology are highly desirable. One year of physics is also suggested.

Students taking major work in genetics will ordinarily minor in botany, zoology, bacteriology, biochemistry, mathematics, animal husbandry, farm crops, or horticulture.

For description of courses, see page 188.
Open to graduates and advanced undergraduates. Major or minor. 530, 535, 540, 550.
Open to graduates only. Major or minor. 600, 605, 651, 652, 653, 660.

GEOLOGY

The department offers major work for the degree of Master of Science in applied geology, and minor work to students taking major work in other departments.

Students desiring to major in geology should have completed the equivalent of the following courses: 201, 202, 203, 354, 355, 356; and 434, 435, 436 or 454, 455.

Minor work is usually recommended in mining engineering, chemistry, or zoology.

For description of courses, see page 190.
Open to graduates for minor only. 434, 435, 436, 454, 455.
Open to graduates and advanced undergraduates. Major or minor. 557, 558, 566, 571, 572, 573, 574.
Open to graduates only. Major or minor. 664, 665.

HISTORY AND GOVERNMENT

The department offers major work for the degree of Master of Science in economic history; and minor work in economic history and government to students taking major work in other departments.

Students desiring to major in economic history must present a minimum of thirty undergraduate quarter credit hours in the general field of history, nine of which may be in political science and in economics.

For description of courses, see page 191.
Open to graduates for minor only.
Economic History. 401, 402, 403, 421, 422, 423, 496.
Government. 424, 435, 436, 446, 468, 476, 495.
Open to graduates and advanced undergraduates. Major or minor.
Economic History. 520, 534, 564, 565, 568, 595.
Open to graduates only. Major or minor.
Economic History. 604.

HOME ECONOMICS EDUCATION (See Vocational Education, page 101.)

HOME MANAGEMENT

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of one year's work in each of the following: elementary design, textiles and clothing, economics and sociology; foods and nutrition, including elementary foods and dietetics; one course each in child development, home management, and general psychology.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 207.

Open to graduates for minor only. 474, 475.

Open to graduates and advanced undergraduates. Major or minor. 517, 518, 570, 584.

Open to graduates only. Major or minor. 614, 677, 684.

HORTICULTURE

The department offers major work for the degree of Master of Science in general horticulture, pomology, vegetable crops, floriculture, and plant breeding; major work for the degree of Doctor of Philosophy in horticulture; and minor work to students taking major work in other departments.

Prerequisife to major graduate work is the completion of courses covering the general field of horticulture and the underlying sciences. Students with major problems in pomology, floriculture, vegetable crops, or plant breeding should present the equivalent of 15 quarter hours (10 semester hours) of undergraduate work in their respective fields, one course in general horticulture, and at least one course in one of the other branches of horticulture mentioned above. The student should also have a working knowledge of inorganic and organic chemistry, botany, and soils equivalent to the requirements outlined in the general curriculum for horticultural students in this institution. In certain cases undergraduate courses in farm crops, soils, botany, and chemistry may be substituted for horticulture.

Students taking major work in horticulture will usually take minor work in soils, genetics, botany (physiology, pathology, or morphology), entomology, chemistry, agricultural economics, or vocational education.

For description of courses, see page 218.

Open to graduates and advanced undergraduates. Major or minor. 501, 514, 516, 518, 521, 522, 523, 524, 525, 526, 527, 528, 546, 547, 564.

Open to graduates only. Major or minor. 600, 601, 602, 603, 604.

HOUSEHOLD EQUIPMENT

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work for the degree of Master of Science in household equipment is credit in beginning food courses, 12 quarter credits in advanced physics (covering in detail mechanics, electricity, heat, and light), 9 quarter credits in household equipment, and chemistry (general, organic, and quantitative methods). It is recom-

mended that the student should have a general background in home economics, but students with fundamental training in chemistry, physics, and bacteriology may be accepted.

Students taking major work in household equipment will usually select their minors from economics, foods and nutrition, institution management, or physics.

For description of courses, see page 209.
Open to graduates for minor only. 404, 405, 435.
Open to graduates and advanced undergraduates. Major or minor. 506, 507, 508, 509, 514, 521, 522, 523.
Open to graduates only Major or minor. 604, 614.

INDUSTRIAL ARTS

The department offers major work for the degree of Master of Science in industrial arts, and minor work to students taking major work in other departments.

Students desiring to major in industrial arts must be graduates of the undergraduate curriculum in industrial arts, or of a recognized four-year collegiate curriculum in industrial or manual arts, or they must present with the Bachelor's degree, thirty-six quarter-credits in industrial arts (including manual training), and fifteen credits in psychology and education, or offer a substantial equivalent.

Major work is to be selected from the courses in industrial arts and certain courses in mechanical engineering which relate to industrial arts education. Minor work is recommended to be selected from courses in vocational education and psychology.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 223.
Open to graduates and advanced undergraduates. Major or minor. 504, 510, 515, 516, 518, 524, 525
Open to graduates only Major or minor. 600, 605, 607, 608, 609, 610, 614, 617, 620, 630, 650.

INSTITUTION MANAGEMENT

The department offers joint major work in co-operation with other departments for the degree of Master of Science, and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least twenty-three quarter credits of undergraduate work in home economics, thirteen of which should be in institution management (large quantity cookery, purchasing, institutional equipment, and catering), seven in foods and nutrition (nutrition and dietetics, and meal planning), and three in household equipment.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 211.
Open to graduates for minor only. 484, 485.
Open to graduates and advanced undergraduates. Major or minor. 580, 587, 588.
Open to graduates only. Major or minor. 604, 614.

LANDSCAPE ARCHITECTURE

The department offers major work for the degree of Master of Landscape Architecture, and minor work to students taking major work in other departments. The degree of Master of Landscape Architecture is granted upon the completion of one year of satisfactory resident graduate work and the acceptance of a thesis based upon at least one full year of subsequent successful professional practice.

Students desiring to major in this department should present credits in landscape architecture substantially equivalent to those secured by undergraduate students in the curriculum in landscape architecture at this institution.

For description of courses, see page 235.

Open to graduates for minor only. 334, 335, 343, 401, 402, 403, 404, 411, 412, 413, 421, 422, 423, 436.

Open to graduates only. Major or minor. 600.

LIBRARY

The department offers courses designed particularly to meet the demand for university librarians and assistants who have had considerable work, in scientific and technical fields. The courses taken should be supplemented by a year's work at a graduate library school and are not to be considered as a substitute for such work. The courses offered below leading to the degree of Master of Science must be taken as a divided major with certain selected departments. Satisfactory library experience under approved conditions and a reading knowledge of both French and German will be required.

In addition, the library extends facilities of bibliographic research in the sciences and technical literature of the departments giving graduate instruction. The course, "Bibliographic Research" (Library 614) may be allowed as either major or minor credit in any department.

For description of courses, see page 237.

Open to graduates only. Major or minor. 614, 615, 616, 617, 618, 619.

MATHEMATICS

The department offers major work for the degree of Master of Science in mathematics and statistics; major work leading to the degree of Doctor of Philosophy in special fields of applied mathematics; and minor work to students taking major work in other departments.

Students desiring to major in this department should present at least fifteen quarter-credit hours of work in mathematics beyond calculus. It is desirable that this should include differential equations, solid analytic geometry, and theory of equations.

Minor work is usually required in physics, chemistry, engineering, or certain phases of agriculture.

For description of courses, see page 238.

Open to graduates for minor only. 300, 314, 315, 330, 334, 400, 405, 406, 441, 442, 443, 444, 445, 497.

Open to graduates and advanced undergraduates. Major or minor. 514, 515, 516, 535, 536, 540, 550, 554, 555, 599.

Open to graduates only. Major or minor. 600, 604, 605, 610, 611, 612, 613, 620, 624, 625, 626, 627, 631, 632, 633, 640, 651, 652, 653, 654, 655, 656, 657, 658, 659, 664, 665, 666, 671, 672, 673, 674, 675, 681, 682, 683, 699.

MECHANICAL ENGINEERING

The department offers major work for the degree of Master of Science in mechanical engineering and minor work to students taking major work in other departments. The department certifies for the professional degree of Mechanical Engineer.

Students desiring to major in this department should have completed an undergraduate curriculum equivalent to that required of undergraduates in mechanical engineering at this institution.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 242.

Open to graduates for minor only. 315, 344, 410, 414, 415, 416, 418, 420, 424, 425, 426, 428, 429, 430, 434, 435, 440, 444, 445, 448, 484, 486, 489.

Open to graduates only. Major or minor. 600, 624, 626, 640, 645, 647, 655, 678, 685, 688.

MINING ENGINEERING (See page 89.)

PHYSICAL EDUCATION FOR MEN

The department offers minor work to students taking major work in other departments.

For description of courses, see page 249.

Open to graduates for minor only. 314, 315, 316, 317, 424, 491, 492, 493.

PHYSICS

The department offers major work for the degree of Master of Science in physics and for the degree of Doctor of Philosophy in special fields of applied physics, and minor work to students taking major work in other departments.

Prerequisites to major graduate work in physics are: a college course in general physics, at least a year's laboratory course in introductory physical measurements, and additional courses in physics with a total of at least ten credit hours. Mathematics through calculus, and chemistry are also required.

Minor work is usually recommended in mathematics, chemistry, or various phases of engineering.

For description of courses, see page 252.

Open to graduates for minor only. 311, 312, 313, 316, 321, 322, 323, 404, 450, 498.

Open to graduates and advanced undergraduates. Major or minor. 501, 502, 503, 504, 505, 506, 514, 515, 516, 519, 520, 524, 525, 534, 594, 595.

Open to graduates only. Major or minor. 607, 610, 611, 612, 613, 614, 615, 620, 624, 625, 637, 638, 640, 650, 651, 652, 653, 681, 682, 683.

PSYCHOLOGY

The department offers minor work to students taking major work in other departments.

For description of courses, see page 254.
Open to graduates for minor only. 410, 414, 415, 416, 420, 424, 426, 433, 434, 438, 444, 454, 464, 468, 474, 484, 485, 488, 496, 620, 634, 635, 636.

SOILS (For description, see Agronomy, page 86)

TEXTILES AND CLOTHING

The department offers major work for the degree of Master of Science and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of one year's work in history and in economics, chemistry (including inorganic, organic, quantitative, and textile), household physics, applied art (including composition, design, and drawing), and textiles and clothing (including general textiles, clothing construction, and costume design). In addition to the foregoing general requirements, additional prerequisites will be required, depending upon the nature of the work the student wishes to pursue.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 213.
Open to graduates for minor only. 444, 464.
Open to graduates and advanced undergraduates. Major or minor 504, 514, 524, 525, 526, 527, 544, 545, 554, 565, 590.
Open to graduates only. Major or minor. 610, 614.

THEORETICAL AND APPLIED MECHANICS

The department offers major work for the degree of Master of Science in theoretical and applied mechanics, and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution, and should include the prerequisite undergraduate courses necessary for the particular line chosen.

For description of courses, see page 261.
Open to graduates for minor only. 324, 327, 338, 344, 378, 498.
Open to graduates and advanced undergraduates. Major or minor. 514, 515, 516, 524, 594, 595.
Open to graduates only. Major or minor. 600, 606, 614, 664, 665, 666.

VETERINARY ANATOMY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in microscopic and gross anatomy; and minor work to students taking major work in animal husbandry, biological chemistry, pathology, physiology, zoology, and bacteriology.

Prerequisite to major graduate work is the completion of an undergraduate curriculum leading to the degree of Doctor of Veterinary Medicine. Exceptions to this rule must be approved by the Dean of Veterinary Medicine.

For description of courses, see page 265.
Open to graduates for minor only. 201, 202, 203.
Open to graduates only. Major or minor. 616.

VETERINARY HYGIENE

The department offers major work for the degree of Master of Science in veterinary bacteriology and veterinary hygiene; major work for the degree of Doctor of Philosophy in veterinary bacteriology; and minor work to students taking major work in other departments.

The research facilities of the Department of Veterinary Research are available to approved and qualified students.

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that in veterinary medicine.

For description of courses, see page 266.
Open to graduates and advanced undergraduates. Major or minor. 429, 524.
Open to graduates only. Major or minor. 690.

VETERINARY PATHOLOGY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in veterinary pathology, and minor work to students taking major work in other departments.

The research facilities of the Department of Veterinary Research are available to approved and qualified students.

Prerequisite to major graduate work is the completion of an undergraduate curriculum leading to the degree of Doctor of Veterinary Medicine. Exceptions to this rule must be approved by the Dean of Veterinary Medicine.

Minor work is recommended in bacteriology, chemistry, zoology, entomology, physics, botany, or genetics.

For description of courses, see page 269.
Open to graduates for minor only. 255, 256, 354.
Open to graduates only. Major or minor. 650, 655.

VETERINARY PHYSIOLOGY AND PHARMACOLOGY

The department offers major work for the degree of Master of Science in veterinary physiology, and minor work to students taking major work in other departments.

The research facilities of the Department of Veterinary Research are available to approved and qualified students.

Students expecting to do major work should have a fundamental knowledge of physiology, zoology, anatomy, histology, and chemistry. The exact requirements will depend upon the particular line of work the student expects to pursue.

For description of courses, see page 270.
Open to graduates for minor only. 661, 662, 663.
Open to graduates only. Major or minor. 665.

VETERINARY SURGERY

The department offers major work for the degree of Master of Science in veterinary surgery, and minor work to students taking major work in other departments.

Students enrolled for work in this department must be graduates of a recognized veterinary college. Exceptions may be made upon special recommendation of the head of the department and the Dean of Veterinary Medicine.

For description of courses, see page 272.
Open to graduates only. Major or minor. 677.

VOCATIONAL EDUCATION

The department offers major work for the degree of Master of Science in agricultural education, in home economics education, and in vocational education.

MAJOR IN AGRICULTURAL EDUCATION: Prerequisite to enrollment in this group is graduation from a curriculum in technical agriculture substantially equivalent to one of the undergraduate curricula in Iowa State College. This should have included elementary courses in psychology and education.

MAJOR IN HOME ECONOMICS EDUCATION: Students enrolling in this group must have graduated from a technical and professional curriculum substantially equivalent to that required of undergraduate students at Iowa State College. Vocational Education 561, 562, 563, six credits, are included in the major. Minor work may be taken in any department of the Division of Home Economics or in any closely related department; or it may include courses from several home economics departments.

MAJOR IN INDUSTRIAL ARTS EDUCATION: See Industrial Arts, page 96.

MAJOR IN VOCATIONAL EDUCATION: Prerequisite to enrollment in this group is graduation from a non-technical curriculum in a standard college, and the presentation of credits in psychology and education amounting to 30 quarter (20 semester) credits.

The modern language requirement for the degree of Master of Science may be waived upon recommendation of the head of the department.

For description of courses, see page 277.
Open to graduates for minor only. 406, 407, 491, 492, 493, 494, 495, 496, 497, 498, 499.
Open to graduates and advanced undergraduates. Major or minor.
Agricultural and Vocational Education. 501, 502, 503, 521, 522, 523, 534, 535, 536. 544, 545, 554, 561, 562, 563, 584.
Home Economics Education. 504, 506, 507, 508, 509, 514, 517.
Industrial Arts Education. 510, 515, 516, 518, 524, 525.
Open to graduates only. Major or minor.
Agricultural and Vocational Education. 604, 624, 625, 626, 644, 645, 664, 665, 684.
Home Economics Education. 605, 606, 607, 610, 614.
Industrial Arts Education. 600, 608, 609, 617, 650.

ZOOLOGY AND ENTOMOLOGY

The department offers major work for the degrees of Master of Science and Doctor of Philosophy in the fields of animal biology, morphology, ecology, taxonomy, physiology (comparative and insect), protozoology, parasitology, entomology, apiculture, and economic zoology; and minor work to students taking major work in other departments.

Prerequisite to major graduate work is the completion of at least two years of zoological courses, for part of which credit in other biological sciences may be substituted. Comprehensive courses in general zoology and general chemistry (and in most cases also organic chemistry) are required of all students. Specific requirements, in addition to the elementary undergraduate courses along the lines of major work, depend upon previous training and professional experience.

For description of courses, see page 282.

Open to graduates for minor only. 424, 454, 456, 484, 499.

Open to graduates and advanced undergraduates Major or minor. 504, 506, 508, 510, 514, 515, 516, 517, 51[illegible], 520, 525, 526, 527, 534, 557, 558, 564, 565, 566, 576, 577, 578, 585, 594.

Open to graduates only. Major or minor. 617, 624, 665, 674, 677, 684, 690.

Collegiate Instruction

DEFINITION OF A CREDIT. The value of each course is stated in quarter-credits. A credit requires one recitation (involving two hours of preparation), or one three-hour laboratory period or other combination of teacher contact and outside preparation involving a total of three clock hours per week for twelve weeks.

COURSE NUMBERS: In each department the courses, for convenience of reference, are given in numerical order. Non-collegiate courses are numbered from 1 to 99. Junior College courses are numbered from 100 to 299. Courses 300 to 399 are primarily for junior students. Courses 400 to 499 are for senior students. Some courses numbered from 300 to 499 are also available to graduate students for minor credit. Undergraduate courses open to graduate students for major credit are numbered from 500 to 599, inclusive. Courses for graduate students only are numbered 600 and above.

ABBREVIATIONS

A.A. Applied Art
A.E. Agricultural Engineering
Ag.- Agriculture
Agron.- Agronomy
A.H. Animal Husbandry
Arch.E. Architectural Engineering
Bact.- Bacteriology
Bot. Botany
Cer.E.- Ceramic Engineering
Chem.E.—Chemical Engineering

Chem.—Chemistry
C.D.—Child Development
C.E.—Civil Engineering
D.I.—Dairy Industry
Ec.—Economics
E.E.—Electrical Engineering
Engr.—Engineering
Engr. Dr.—Engineering Drawing
Engl.—English
F.C.—Farm Crops
F.&N.—Foods and Nutrition
For.—Forestry
Gen.—Genetics
Gen.E.—General Engineering
Geol.—Geology
Govt.—Government
Hist.—History
H.Ec.—Home Economics
H.Ec.Ed.—Home Economics Education
H.Mgt.—Home Management
Hort.—Horticulture
H.Eq.—Household Equipment
Hyg.—Hygiene
I.A.—Industrial Arts
I.S.—Industrial Science
I.Mgt.—Institution Management
L.A.—Landscape Architecture
Lab.—Laboratory
Lect.—Lecture
Lib.—Library
Math.—Mathematics
M.E.—Mechanical Engineering
Mn.E.—Mining Engineering
M.L.—Modern Languages
Phys.Ed.—Physical Education
Phys.—Physics
Psych.—Psychology
P.S.—Public Speaking
Rec.—Recitation
Rel.Ed.—Religious Education
T.Jl.—Technical Journalism
T.&C.—Textiles and Clothing
T.&A.M.—Theoretical and Applied Mechanics
Vet.Anat.—Veterinary Anatomy
Vet.Hyg.—Veterinary Hygiene
Vet.Med.—Veterinary Medicine
Vet.Ob.—Veterinary Obstetrics
Vet.Path.—Veterinary Pathology
Vet.Phys.—Veterinary Physiology
Vet.Surg.—Veterinary Surgery
Voc.Ed.—Vocational Education
Zool.—Zoology

AGRICULTURAL ECONOMICS

(Including Rural Sociology)

(Administered jointly by the Divisions of Industrial Science and Agriculture as a part of the Department of Economics.)

T. W. Schultz, Head of Department

Professor Von Tungeln: Associate Professors Allbaugh,* Harter, Hopkins, Murray, Robotka, Shepherd, Thomson, Wakeley; Assistant Professors Bentley, Wilcox; Instructors Elkinton, Quintus, Schickele; Graduate Assistants Foote, Griffin, Strand.

The staff in Agricultural Economics and Rural Sociology seeks to analyze and present to students the nature of economic and social forces as they affect the value of agricultural commodities and the well-being of the farming population, and to teach the principles underlying the farmer's adjustment to these forces. Major work is offered in three curricula: Agricultural Business, Farm Organization and Management, and Rural Sociology.

The curriculum in Agricultural Business is designed to meet the growing demand for training in co-operative marketing of agricultural products, rural banking, and other business closely associated with agriculture as well as to train for research and teaching in this field. Sufficient work in agricultural science and technique is provided to give the student a scientific view of the industry.

The curriculum in Farm Organization and Management is designed to train students for actual farming as either proprietors or managers. While the economic and business side is stressed, a large amount of natural science and technical work is required, and the elective privilege enables the student to specialize to a considerable extent in some particular scientific or technical line. This course of study is also designed

*Absent on leave.

to serve as foundation training for professional work in the field of production economics.

The curriculum in Rural Sociology is designed to meet two urgent demands of our present rural life: (1) To train young men and women as leaders and investigators who can serve as salaried experts in the numerous community institutions and organizations whose aim is to develop a larger, happier, and more efficient life for all on the farm; and (2) To enable those students whose major work is taken in a limited and purely technical curriculum to get some work that offers a larger community outlook. Rural Sociology courses taken in conjunction with technical courses prepare the student to be a broadminded citizen and a leader in general community improvement.

Curricula in Agricultural Economics and Rural Sociology

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 117.

For entrance requirements, see page 36.

Agricultural Business Group

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Gen. Agr. Economics Ec. 231[1]	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Livestock Problems A.H. 101	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
Crop Production F.C. 104	4	Crop Production F.C. 105	4	Industrial History Hist. 235	3
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
Military 121	1	Military 122	1	Military 123	1
	17		17		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect.,Ec. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

SOPHOMORE YEAR

El. Economic Statistics Ec. 234	4	Gen. Horticulture Hort. 114	3	Applied Sociology Ec. 384	3
Math. for Students of Ag. Math. 205	4	Physics Phys. 204	3	Business Law Ec. 365	3
American Govt. Govt. 214	3	Reasoning & Writing Engl. 205	3	Farm Mach. & Motors A.E. 334	4
General Botany Bot. 101	3	Farm Dairying D.I. 114	4	Extempore Speaking P.S. 311	3
Military 221	1	Military 222	1	Military 223	1
Electives	3	Electives	3	Electives	3
	18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Money and Banking Ec. 304	3	Money and Banking Ec. 504	3	Advanced Accounting Ec. 375	3
Technical Journalism T.Jl. 225	3	Rural Sociology Ec. 386	3	Technical Journalism T.Jl. 335	3
General Genetics Gen. 300	3	Element. Accounting Ec. 370	3	Fiction Engl. 454,455,456 or Drama Engl. 464,466,467	3
General Psychology Psych. 204	3	Ec. Hist. Mod. Europe Hist. 402	3		
Technical Agr.	3	†Technical Agr.	5	Technical Agr.	4
*Electives	3			*Electives	4
	18		17		17

†May be omitted by students admitted to the Reserve Officers' Training Corps. See page 244.
*The following courses are suggested as desirable electives for this group: Ec. 330, 376, 474, 505, 530, 539, 546, 547, 564; F.C. 305; Hist 534; Govt. 424, 435; Psych. 424, 484, 488.

SENIOR YEAR

Transportation Ec. 545	3	Value & Distribution Ec. 507	3	Value & Distribution Ec. 508	3
International Ec. Policies Hist. 568	3	Co-operation in Agriculture Ec. 335	3	Farm Accounting Ec. 534	4
Land Economics Ec. 334	3	Agricultural Finance Ec. 535	3	Prices of Farm Products Ec. 536	3
*Electives	8	*Electives	8	*Electives	7
	17		17		17

Farm Organization and Management Group

(Freshman year is same as in Agricultural Business Group)

SOPHOMORE YEAR

El. Ec. Statistics Ec. 234	4	Gen. Horticulture Hort. 114	3	Applied Sociology Ec. 384	3
Math. for Ag. Students Math. 205	4	Physics Phys. 204	3	Farm Mach. & Motors A.E. 334	4
Organic & Quant. Chem. 255	3	Organic & Quant. Chem. 256	3	Soils Soils 254	3
General Botany Bot. 101	3	Gen. Plant Pathology Bot. 207	4	Breeds of Beef and Dual-Purpose Cattle A.H. 203	2
Military 221	1	American Govt. Govt. 214	3	Farm Dairying D.I. 114	4
Electives	2	Military 222	1	Military 223	1
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Land Economics Ec. 334	3	Rural Sociology Ec. 386	3	Farm Accounting Ec. 534	4
General Genetics Gen. 300	3	Money & Banking Ec. 304	3	Animal Breeding A.H. 350	3
Entomology Zool. 274	4	General Bacteriology Bact. 304A	5	Pasture and Hay Crops F.C. 404	3
Breeds of Dairy Cattle and Hogs A.H. 201	3	Cereal Crops F.C. 204	3	Reasoning & Writing Engl. 205	3
*Electives	4	*Electives	3	*Electives	4
	17		17		17

SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Adv. Farm Organ. and Management Ec. 530	3	Value and Distribution Ec. 507	3	Value and Distribution Ec. 508	3
Business Law Ec. 365	3	Co-operation in Agr. Ec. 335	3	Prices of Farm Products Ec. 536	3
Soil Management Soils 454	3	Agricultural Finance Ec. 535	3	Animal Feeding A.H. 414	5
*Electives	8	*Electives	8	*Electives	6
	17		17		17

*The following courses are suggested as desirable electives for this curriculum: Psych. 204; Engl. 254, 255; Hist. 568; Govt. 424; Zool.111, 534; Vet.Hyg. 427; Vet.Anat. 217; A.E. 306; A.H. 337; Hort. 521, 364; F.C. 414, 504; Soils 254.

Rural Sociology Group

(Freshman and Sophomore years same as in the Agricultural Business Group)

JUNIOR YEAR

Applied Sociology Ec. 385	3	Money and Banking Ec. 304 or Agricultural Finance Ec. 535	3	Rural Sociology Ec. 386	3
General Genetics Gen. 300	3			Princ. Sec. Education Voc.Ed. 306	3
Princ. of Education Voc.Ed. 304	3	Co-operation in Agr. Ec. 335	3	Human Physiology Zool. 255	5
General Biology Zool. 104	3	*Electives	11	*Electives	6
*Electives	5				
	17		17		17

SENIOR YEAR

Beg. Tech. Journalism T.Jl. 225	3	Social Legislation Ec. 588	3	Public Finance Ec. 505	3
Rural Social Organization Ec. 587	3	Recreational Activities Ec. 484	3	Rural Population Ec. 585	3
Agricultural Policy Ec. 547	3	Land Economics Ec. 334 or Value & Distribution Ec. 507	3	Leadership Ec. 586	3
*Electives	8	*Electives	8	Applied Sociology Ec. 580	3
				*Electives	5
	17		17		17

*Electives are to be chosen in consultation with the head of the major work and in the main from departments offering major work.

Description of Courses

For additional courses in Economics and Sociology, see page 167.

110. **Technical Lecture.** The field of agricultural economics and rural sociology. Spring. Lect. 1. Required.

231, 232, 233. **General Agricultural Economics.** (231) Farm organization and management. The economic factors involved in the successful organization and operation of a farm. Fall, Winter. (232) Principles of value, and price developed in connection with farm marketing problems; marketing methods; market price; supply and demand and their determinants; elasticity of demand and supply. Prerequisite: 231 or equivalent. Winter, Spring. (233) Principles of distribution developed around the problems of farm income, cost of production and price, labor and wages, savings and interest, land and rent, profits as a reward for business enterprise, and risk taking. Prerequisite: 232. Fall, Spring. Rec. 3. Credit 3 each course.

234. **Elementary Economic Statistics.** The principles and methods of gathering, analyzing, presenting, and interpreting economic data. Fall, Winter. Rec. 3. Lab. 1, 3 hr. Credit 1 or 4. Students who have classified in or have received credit in Math. 441 may enroll in the laboratory of this course for 1 credit. In all other cases both recitation and laboratory are required.

330. **Creamery Accounting.** A specialized accounting system for creameries. Construction and interpretation of creamery operating statements and balance sheets. Prerequisite: 370 or equivalent. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

334. **Land Economics.** Problems in land ownership. Land tenure. Factors affecting the value of farm land. Selling practices. Regional changes in land utilization. Prerequisite: 233 or equivalent. Fall. Rec. 3. Credit 3.

335. **Co-operation in Agriculture.** The co-operative type of business enterprise with particular reference to its application in farm marketing. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

336. **Farm Management and Accounting.** Principles of farm organization and management applied to Iowa farming. Technique of farm management including the use of farm accounting data. Prerequisite: 233 or equivalent. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

384. **Applied Sociology.** Means and measures of social assimilation, social adaptation and social control as related to social progress. Fall, Winter, Spring. Rec. 3. Credit 3.

385. **Applied Sociology.** History, development, and status of the family with special reference to influences affecting American family life. Fall, Winter, Spring. Rec. 3. Credit 3.

386. **Introduction to Rural Sociology.** Rural social problems. Development and functioning of basic rural social institutions. Cultural backgrounds, standards and methods as related to co-operative efforts and social change. Fall, Winter, Spring. Rec. 3. Credit 3.

396. **Forest Finance.** (For. 396). Appraisal of forest land and stumpage. Determination of the profit of forests compared with other land uses. Land classification, forest taxation and credit. Prerequisite: 231. Spring. Rec. 4. Credit 4.

430. **Practice Course in Marketing.** Study of the methods and practices of a market agency while the student is in its employ. Written plans and reports. Prerequisite: permission of instructor. Credit 1 to 3.

438. **Lumber Markets.** (For. 438). Economics of the timber industry. Wholesaling and retailing. Exports and imports of lumber and other forest products; prices; lumbermen's associations; freight rates, etc. Prerequisite: 231. Winter. Lect. and rec. 4. Credit 4.

470. **General Forestry Economics.** (For. 470). Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests. Prerequisite: 231. Spring. Rec. 3. Credit 3.

480. **Industrial Sociology.** Study and evaluation of leadership and welfare work in industry—industrial health, housing, recreation, retirement pensions, unemployment insurance, joint-representation, and management stabilization, etc. Winter, Spring. Rec. 3. Credit 3.

484. **Recreational Activities.** Theory and practice in making and supervising recreational programs to develop voluntary leaders for group recreation and to strengthen community organization. Prerequisite: 384 or equivalent. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

499. **Special Problems.** Prerequisite: 203, or equivalent and 386 for Rural Sociology. As arranged. Fall, Winter, Spring. Credit 1 to 5.

A. Agricultural Economics
B. Consumption Economics
C. Industrial Economics
D. Rural Sociology

510. **Land Use.** Elementary outlines of land economics. Landlord-tenant relationships. Absentee landlordism. Land values and taxations. Public finance of local governments. Land classification. Rural zoning. Prerequisite: 203 or equivalent. Summer. Credit 3 or 4.

530. **Advanced Farm Organization and Management.** Technique of farm organization and management, particularly as developed in Iowa farming. Prerequisite: 233 or equivalent. Fall. Lectures 2. Lab. 1, 3 hr. Credit 3.

534. **Farm Accounting.** Principles of accounting adapted to the farm business. Application of accounting data to farm management. Prerequisite: 233, 370. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

535. **Agricultural Finance.** Financial requirements of individual farmers and of farmers' marketing and purchasing organizations. Credit institutions serving farmers and their organizations. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

536. **Prices of Farm Products.** Agricultural prices including an analysis of their characteristic movements and their position relative to the general price level in the business cycle. Prerequisite: 233. Spring. Rec. 3. Credit 3.

537. **Statistical Analysis.** Correlation analysis; methods of analysis of prices, production data and similar series of time variables. Prerequisite: 234 or Math. 441. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

538. **Market Price Determination.** Price making in the market place. Relationship among farm wholesale and retail prices. Speculation and prices. Prerequisite: 233 or equivalent. Spring. Rec. 3. Credit 3.

539. **Structure of Agricultural Markets.** Relation of the middleman system to farmers on the one hand and processors or consumers on the other. Prerequisite: 233 or equivalent. Spring. Rec. 3. Credit 3.

540. **Economic Geography of Agriculture.** Geographic and economic survey of the conditions under which the world's supplies of agricultural products are obtained; trade routes; centers of trade in agricultural products. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

545. **Transportation.** Development of means of transportation including highways, waterways, and railways; relation of transportation to agriculture, general industry, and the formation of market centers. Prerequisite: 203 or equivalent. Fall, Spring. Lect. and rec. 3. Credit 3.

546. **Railway Traffic and Rates.** Theory and practice of rate making and regulation; traffic practice and problems, effect of rates on production and trade. Prerequisite: 545. Winter. Rec. 3. Credit 3.

547. **Agricultural Policy.** The relation of agriculture to the economic life of the nation. Problems arising out of the agricultural and industrial development. Prerequisite: 233 or equivalent. Fall. Lect. 3. Credit 3.

550. **Land Income and Policy.** Land as a factor of production. Economics of land utilization. Theories of rent. Principles of land valuation and taxation. Educational policies pertaining to land use. Conservation. Legislation. Recent tendencies in land use planning. Prerequisite: 203 or equivalent. Summer. Credit 3.

580. **Applied Sociology.** Sociological thought and problems. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3.

585. **Rural Population.** Composition, characteristics, and movement of rural population as compared with urban. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3.

586. **Rural Leadership.** Specific problems of rural life; selection, development, tasks, obligations, and opportunities of rural leadership. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3.

587. **Rural Social Organization.** Place and function of farmer movements and organizations in a changing rural order. Objectives and role of formal and informal organization in neighborhood, community and rural-urban groups. Prerequisite: 233, 386. or equivalent. Fall. Rec. 3. Credit 3.

588. **Social Legislation and Social Problems.** Analysis of existing, proposed, and needed social legislation and study of methods of attack on social problems. Prerequisite: 233, 386, or equivalent. Winter, Spring. Rec. 3. Credit 3.

599. **Special Topics.** Prerequisite: 233 or equivalent, and 386 for Rural Sociology. Fall, Winter, Spring. Credit 1 to 5.

A. Agricultural Economics. Messrs. Allbaugh, Hopkins, Murray, Robotka, Quintus, Schickele, Schultz, Shepherd, Wilcox.
B. Consumption Economics. Misses Hoyt, Reid.
C. Industrial Economics. Messrs. Benedict, Fuller, Wright.
D. Rural Sociology. Messrs. Anderson, Von Tungeln, Wakeley.

631, 632, 633. **Agricultural Marketing.** By arrangement. Fall, Winter, Spring, respectively. Credit 3 each course. Mr. Robotka, Mr. Shepherd.

634. **Land Valuation.** Spring. Credit 3. Mr. Murray.

641, 642, 643. **Economics of Production.** Including farm accounting and land economics. By arrangement Fall, Winter, Spring, respectively. Credit 3 each course. Messrs. Allbaugh, Schickele, Wilcox, Schultz.

650. **Seminar.** Staff and graduate student conference. May be taken for not to exceed three hours' credit in any quarter. Mr. Schultz.

699. **Research in Economics and Sociology.**

A. Farm Management and Organization. Messrs. Allbaugh, Hopkins, Murray.
B. Farm Finance. Mr. Murray.
C. Foreign Trade. Mr. Schultz.
D. Land Economics. Messrs Schickele, Schultz, Wilcox.
E. Marketing. Messrs. Fuller, Quintus, Robotka, Shepherd.
F. Price Analysis. Messrs. Hopkins, Shepherd.
G. Consumption Economics. Misses Hoyt, Reid.
H. Industrial Production. Mr. Fuller.
I. Industrial and Public Finance. Messrs Benedict, Wright.
J. Rural Sociology. Messrs Anderson, Wakeley, Von Tungeln.

AGRICULTURAL EDUCATION

See *Vocational Education*, page 273.

AGRICULTURAL ENGINEERING

(Administered jointly by the Dean of Agriculture and the Dean of Engineering.)

J. B. DAVIDSON, Head of Department

Professor Giese; Associate Professors Ayres, Dickerson, Sharp; Instructor Carter

Extension Workers Van Vlack, Virtue

For information concerning the Division of Agriculture, see page 58; *for the Division of Engineering, see page* 63.

The department of Agricultural Engineering offers instruction in courses involving the application of engineering knowledge to the solution of farm problems. The most important of these subjects are farm machinery, farm motors, farm buildings, farm sanitary equipment, soil erosion control, drainage and irrigation. All students in agricultural curricula take one or more of these courses.

The department also provides for students who wish to specialize in Agricultural Engineering. A four-year curriculum leading to the degree of Bachelor of Science in Agricultural Engineering was established in 1909. This curriculum includes mathematics, sciences, and fundamental subjects in the different engineering departments; agricultural courses selected to familiarize the student with the methods of modern scientific agriculture; and thorough treatment of agricultural engineering courses.

Graduates from this curriculum have taken up work along the following lines: College, extension, experiment station and government work in agricultural engineering; advertising, sales and development work with manufacturers of various lines of farm equipment and farm building materials; engineering and contracting on farm buildings, soil erosion control, and drainage; editorial work on farm and trade journals;

and farming where drainage, farm structures, and the use of machinery are important factors.

Special Curriculum for Engineering Students

The degree of Bachelor of Science in Agricultural Engineering is given to students who have completed a four-years' curriculum in Civil, Mechanical, or Electrical Engineering, followed by one year's prescribed work, approved by the Committee on Advanced Standing and the General Faculty.

Curriculum in Agricultural Engineering

Leading to the degree of Bachelor of Science.

Six months of practical work in agriculture or engineering under the direction of this department is required before graduation.

For entrance requirements, see page 36.

For graduate work, see page 86.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Applied Chemistry Chem. 107	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Analytic Geometry Math. 103	5
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1	Carpentry A.E. 155	2
Drawing and Projection Engr. Dr. 131	2	Theory of Project. Draw. Engr. Dr. 132	3	Working Drawings Engr. Dr. 133	2
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Lib. 106C (Winter); Tech.Lect. A.E. 110 (Spring).

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Farm Machinery A.E. 236	3	Crop Production F.C. 104	4	Dairy Principles D.I. 310	2
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Economic History Hist. 324	3	General Horticulture Hort. 114	3	Engineering Problems Gen.E. 206	1
Livestock Problems A.H. 101	2	Military 202 or 222	1	Livestock Problems A.H. 102 or 103	2
Military 201 or 221	1			Statics of Engineering T.&A.M. 274	3
				Military 203 or 223	1
	18		17		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Surveying C.E. 321	3	Rural Structures A.E. 375	3	Farm Power A.E. 346	4
Gen. Agr. Economics Ec. 231	3	Machine Construction A.E. 359	2	Farm Drainage A.E. 324	3
Materials Lab. T.&A.M. 327	1	Surveying C.E. 322	3	Surveying C.E. 323	3
Properties of Materials T.&A.M. 334	2	Dynamics of Engineering T.&A.M. 344	4	Hydraulics T.&A.M. 378	4
Mechanics of Materials T.&A.M. 324	5	Rural Landscape Design L.A. 208	3	Crop Production F.C. 105	4
Machine Work M.E. 282	2	†Extempore Speaking P.S. 311	2		
Power Measure. Lab. M.E. 354	1	Elective	1		
	17		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, A.E. 301, 302, 303.

†May be omitted by students admitted to the Reserve Officers' Training Corps. For full information, see page 244.

SENIOR YEAR

Seminar A.E. 401	1	Seminar A.E. 402	1	Seminar A.E. 403	1
Land Development A.E. 425	4	Irrigation A.E. 427	3	Rural Structures A.E. 476	3
Engineering Contracts Engr. 405	3	Farm Power A.E. 447	3	Engineering Valuation Engr. 407	3
Direct Current E.E. 435	3	Alternating Currents E.E. 437	3	Feeds and Feeding A.H. 416	3
Direct Current Lab. E.E. 436	1	Alternating Current Lab. E.E. 438	1	Farm Utilities A.E. 487	3
Soils Soils 254	3	Fertility and Fertilizers Soils 354	5	Electives	5
Electives	3	Electives	2		
	18		18		18

Description of Courses

For description of non-collegiate courses, see page 287.

110. **Technical Lecture.** General and agricultural engineering subjects. Spring. Lect. 1. Required.

155. **Carpentry.** (I.A. 155.) Care and use of tools, construction and repair of farm buildings, self-feeders, garages, etc.; framing, lumber bills; drawing. Spring. Lab. 2, 3 hr. Credit 2.

157. **Dairy Mechanics.** For dairy industry students. Sanitary and common pipe fitting, soldering, tinning, belts, pulleys, bearings, painting, valves, and repair of dairy equipment. Lab. 2, 3 hr. Credit 2. Fall.

236. **Farm Machines.** Mechanics and materials. Construction, adjustments, operation, testing, selection, and cost of use of farm machines. Prerequisite: credit or classification in Phys. 221. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

238. **Horticultural Machinery.** Construction, adjustment, operation, and care of tillage, potato, garden, and spray machinery and gas engines. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

239. **Dairy Machinery.** Construction, adjustment, operation, and care of dairy machines and equipment, boilers, engines, motors, refrigerating and power machinery. Winter. Rec. 4. Lab. 1, 3 hr. Credit 5.

254. **Farm Mechanics.** Includes elementary forge work, soldering, harness repairing, pipe fitting, rope splicing, elementary electric wiring, repair of farm machinery. Fall, Winter, Spring. Lab. 2, 3 hr. Credit 2.

301, 302, 303. **Seminar.** Preparation, presentation and discussion of papers on agricultural engineering subjects. Rec. 1. Required each course.

306. **Farm Surveying and Drainage.** For students in Agriculture. Design, location and construction, drainage, surveying. Land surveying for area and mapping. Land descriptions. Drawing maps. Fall, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

324. **Farm Drainage.** Drainage problems of the individual farm; design, location and construction of laterals. Protecting farms from overflow and soil erosion. Prerequisite: credit or clasification in C.E. 323. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

334. **Farm Machinery and Power Management.** Mechanics and materials. Construction, adjustment, operation, and testing of farm machinery; measurement and transmission of power. Prerequisite: Physics 204 or equivalent, except for Agricultural Journalism and Two-Year Agricultural students. Fall, Winter, Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

345. **Gas Engines and Tractors.** Construction, operation, adjustment, and care of gasoline and oil engines and tractors. Prerequisite: 334. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

346. **Farm Motors.** Construction, adjustment, operation, care, testing, selection, and cost of use of farm engines and tractors. The horse as a motor; windmills, small water wheels, etc. Prerequisite: Phys. 222. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

356. **Farm Building Construction.** Similar to Agricultural Engineering 155 but more advanced. Includes the planning, construction and repair of farm buildings and appliances. Prerequisite: 155. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

359. **Machine Construction.** Repair of machanical farm equipment and construction of experimental machines. Oxy-acetylene and electric welding. Winter. Lab. 2, 3 hr. Credit 2.

374. **Concrete and Masonry.** Materials, specification, and tests; mixtures, forms, reinforcement; uses of concrete on the farm. Other fireproof building materials. Fall, Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

375. **Farm Structures.** Arrangement of buildings. Planning farm buildings with special regard to livestock requirements, economy, convenience, sanitation, and appearance, and materials used. Prerequisite: credit or classification in T.&A.M. 327. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

401, 402, 403. **Seminar.** Preparation, presentation and discussion of papers on agricultural engineering subjects. Rec. 1. Credit 1 each course.

420. **Drainage and Flood Control.** Rainfall and run-off studies. Stream flow. Laws governing organization and operation of drainage districts. Irrigation. Prerequisite: C.E. 313, Soils 254. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

425. **Land Development.** Reclamation by drainage, flood protection, and pumping. Community outlet problems. Analysis of hydrographic data and flood control. Land clearing. Prerequisite: 324. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

427. **Irrigation.** Water supply, rights, duty, conveyance, pumping. Effects of over-irrigation; remedies; seepage flow. Distributory systems. Irrigation structures. Prerequisite: C. E. 323, Soils 254, T. & A.M. 378. Winter. Rec. 3. Credit 3.

428. **Erosion Structures.** Engineering aspects of soil erosion and its control. Soil saving checks and dams. Terracing. Prerequisite: C.E. 313, Soils 254. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

447. **Farm Machinery and Power.** Design problems peculiar to farm mechanical equipment. Selection and management of equipment for meeting specific farm conditions and for producing specific crops. Prerequisite: 236. Winter. Rec. 3. Credit 3.

476. **Farm Structures.** Continuation of 375. Details of construction, cost estimating, specifications and bills of materials. Special problems. Perspective drawing and simple rendering. Prerequisite: 375. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

487. **Farm Utilities.** Lighting, heating, ventilation, water supply, plumbing, sewage disposal. Prerequisite: 375, Phys. 223. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

489. **Farm Buildings and Equipment.** For Animal Husbandry students. Plans, materials, construction, lighting, heating, and ventilation of farm buildings; water supply, sewage disposal. Fall, Winter. Rec. 2. Lab 1, 3 hr. Credit 3.

528. **Special Topics.** Land development; drainage and irrigation. Mr. Ayres.

536, 546. **Special Topics.** (536) Machine problems. (546) Power Problems. Mr. Davidson, Mr. McKibben.

577, 587. **Special Topics.** (577) Structures (587) Utilities. Mr Davidson, Mr. Giese.

609. **Airport Drainage.** Design, location, and construction of drainage systems to insure proper surface and sub-surface water control. Special soil treatment methods to promote growth and maintenance of turf. Rec. 1. Lab. 2, 3 hr. or as arranged. Credit 3. Mr. Ayres.

628. **Land Reclamation Problems.** Soil water, drainage practice, engineering and institutions. Irrigation practice, construction, and organization. Cutover land problems. Mr. Ayres.

636. **Research.** Design, testing, and efficiency of farm implements and machines. Messrs. Davidson, McKibben, Collins.

646. **Research.** Power problems, including application, efficiency, and economy of power. Messrs. Davidson, McKibben, Collins.

661, 662, 663. **Seminar.** Discussion of research problems, methods, procedure, and reports. Required of all graduate students in agricultural engineering. No credit. Mr. Davidson.

677. **Research.** Design of farm structures, materials for farm structures. Mr. Davidson, Mr. Giese.

687. **Research.** Sanitary equipment, including sewage disposal, water supply, heating, lighting, and ventilation. Mr. Davidson, Mr. Giese.

AGRICULTURAL JOURNALISM

See *Technical Journalism*, page 258.

AGRICULTURE

H. H. KILDEE, Dean of Agriculture

For information concerning the Division of Agriculture, see page 58.

Curriculum in General Agriculture

Leading to the Degree of Bachelor of Science.

Six months of practical work under the direction of the division is required before graduation. See page 117.

For entrance requirements, see page 36.

The curriculum in General Agriculture is planned to provide training for students who wish a broad, general knowledge of agriculture, and also the opportunity for special study in certain related fields in the natural sciences, the social sciences or the applied sciences. Those who are looking forward to finding their life work on the farm, will secure in this curriculum the courses which will fit them in the broadest way for useful, well-rounded, successful careers.

While the curriculum is very similar to that of certain other agricultural curricula in the first two years, in the junior and senior years emphasis has been placed upon courses which provide fundamental knowledge necessary for the attainment of the objectives of agriculture as formulated and approved by the Faculty of the Division of Agriculture.

Sufficient elective opportunity is provided in the junior and senior years to permit students to select sequences of courses in lines of work

in which they are particularly interested. Electives are to be chosen in conference with the Dean. In general at least one-half of the total number of elective hours should be in a single field.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Composition Engl. 101[1]	3	Composition Engl. 102	3	Composition Engl. 103	3
General Botany Bot. 101	3	General Zoology Zool. 114	3	Botany or Zoology Bot. 103 or Zool. 115	3
Crop Production F.C. 104	4	Crop Production F.C. 105	4	Farm Dairying D.I. 114	4
Livestock Problems A.H. 101	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
General Horticulture Hort. 114	3	General Chemistry Chem. 101	4	General Chemistry Chem. 102	4
Military 121	1	Military 122	1	Military 123	1
	16		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Orientation, Ag. 101, 102; Ag. 104, see page 117.

SOPHOMORE YEAR

Gen. Agr. Econonics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Qualitative Analysis Chem. 103	4	Organic and Quant. Chem. 255	3	Organic and Quant. Chem. 256	3
Mathematics Math. 205	4	Physics Phys. 204	3	Farm Mach. & Power Mgt. A.E. 334	4
Breeds of Livestock A.H. 205	4	Rural Landscape Design L.A. 208	3	Soils Soils 254	3
		Extempore Speaking P.S. 311	3	Technical Journalism T.Jl. 225	3
Military 221	1	Military 222	1	Military 223	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

JUNIOR YEAR

Land Economics Ec. 384	3	Co-operation in Agric. Ec. 335	3	Farm Mgt. & Acctg. Ec. 336	3
General Genetics Gen. 300	3	General Bacteriology Bact. 304A	5	Hay and Pasture Crops F.C. 404	3
Rural Sociology Ec. 386	3	Ec. Hist. of Agriculture Hist. 324	3	Early 19th Century Engl. 254	3
				Fertility and Fertilizers Soils 354	5
Electives	8	Electives	6	Electives	3
	17		17		17

SENIOR YEAR

Agricultural Policy Ec. 547	3	Agricultural Finance Ec. 535	3	American Government Govt. 315	3
Soil Management Soils 454	3	Farm Bldgs. and Equip. A.E. 489	3	Animal Feeding A.H. 414	5
International Ec. Policies Hist. 568	3	Gen. Plant Pathology Bot. 207	4		
Rural Social Organization Ec. 587	3				
Electives	5	Electives	7	Electives	9
	17		17		17

Two-Year Collegiate Curriculum in Agriculture

The two-year collegiate curriculum in agriculture is offered to students who can meet the requirements for admission to the regular four-year college curricula but do not wish to take more than two years of college work.

On the satisfactory completion of this curriculum the student is granted a certificate.

In case a student decides later to complete the full four-year curriculum, he will receive credit toward his degree for the two years of work already completed.

For entrance requirements, see page 36.

FIRST YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credit
Livestock Problems A.H. 101[1]	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
Crop Production F.C. 104	4	Crop Production F.C. 105	4	Farm Dairying D.I. 114	4
General Botany Bot. 101	3	General Chemistry Chem. 101A	4	General Chemistry Chem. 102A	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Farm Mach. and Motors A.E. 334	4	General Horticulture Hort. 114	3	Farm Mechanics A.E. 254	2
Military 121	1	Military 122	1	Military 123	1
	17		17		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Orientation, Ag. 101, 102.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SECOND YEAR

Breeds of Livestock A.H. 201	3	Breeds of Livestock A.H. 202 or	3	Breeds of Livestock A.H. 203	2
Poultry Husbandry A.H. 144	3	Home Landscapes L.A. 206	or 2	Hay and Pasture Crops F.C. 404	3
Organic and Quant. Chem. 255	3	Farm Bldgs. and Equip. A.E. 489	3	Animal Feeding A.H. 414	5
Soils Soils 254	3	Principles of Breeding A.H. 454	3	Gen. Agr. Economics Ec. 233	3
Gen. Agr. Economics Ec. 231	3	Fertility and Fertilizers Soils 354	5	Military 223	1
Military 221	1	Gen. Agr. Economics Ec. 232	3	Electives	3
		Military 222	1		
	16		17 or 18		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

A student desiring a slightly different grouping of courses from that prescribed above will have the privilege of substituting with the approval of the heads of the departments concerned and the Dean of the Division, provided he can meet the standard prerequisites for that work.

A student desiring to take A.H. 270 or A.H. 409 should substitute Vet. Anat. 217 for one of the three credit courses during the Fall Quarter.

Practical Work

Administered by the head of the department in which the student elects to take the work.

Students of the Division of Agriculture must have at least six months of practical experience before graduation. This requirement should be met before the beginning of the junior year.

Description of Courses

101, 102. **Orientation.** Lectures and class work designed to aid the first-year student to adjust himself to his environment, and to present a survey of the fields and opportunities in Agriculture. Fall, Winter. Required.

104. **Practical Work.** Six months required.

404. **International Aspects of Agriculture.** World production of agricultural products. World markets. Conditions affecting cost of production and marketing. Transportation costs. Competition and market requirements. Internatinal trade policies and prices. Winter, Spring. Lect. 2. Credit 2.

AGRONOMY

P. E. Brown, Head of Department

Professors Hughes, Stevenson; Associate Professors Firkins, *Henson, Porter, Smith, Walker, Wentz; Assistant Professors Dorchester, Eldredge, Peterson, Richards; Fellows Bolin, Davis

Extension Workers Boatman, Clapp, Hauser, Dyas, Burson

For information concerning the Division of Agriculture, see page 58.

The curriculum in Agronomy is especially adapted for men who desire broad training in agriculture to enable them to carry out general farming operations successfully or who wish to prepare themselves for more or less highly specialized lines of work which require a fundamental working knowledge of general agriculture, particularly crop production and soil management.

Sufficient elective hours are provided so that in addition to his training in farm crops and soils, any student may specialize in some closely allied science line such as plant pathology, economic entomology, chemistry, botany, bacteriology, geology, rural sociology, or economics, or in any agricultural line such as agricultural economics, farm management, animal husbandry, horticulture, agricultural engineering, technical journalism, or vocational education. Carefully outlined groups of courses along these various lines are prepared for individual students so that elective hours may be utilized to the best advantage.

Over two hundred acres of land devoted to experimental work in farm crops and soils are available for use as laboratories in the various courses offered in the department. These laboratories afford students an unusual opportunity to study important problems in crop production and soil management.

There is an increasing demand for men well trained in crops and

*Absent on leave.

soils, and each year the department is asked to recommend men for desirable positions as county agents, farm managers, extension workers for colleges and railroads, instructors in agriculture in colleges and high schools, investigators in government and state experimental work, assistants in seed houses and similar commercial concerns, and assistants on the editorial staffs of agricultural journals. There are many openings also for men who, with a fundamental knowledge of crops and soils, have specialized in plant pathology, entomology and other lines.

Curriculum in Agronomy

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 117.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Crop Production F.C. 104[1]	4	Crop Production F.C. 105	4	Soils Soils 254	3
Livestock Problems A.H. 101	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
General Botany Bot. 101	3	Farm Mechanics A.E. 254	2	Farm Dairying D.I. 114	4
General Horticulture Hort. 114	3	General Chemistry Chem. 101	4	General Chemistry Chem. 102	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Military 121	1	Military 122	1	Military 123	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., Agron. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

SOPHOMORE YEAR

Forage Crops F.C. 214	4	Crop Seed F.C. 204	3	Fertility and Fertilizers Soils 354	5
Breed Studies A.H. 201	3	Poultry Husbandry A.H. 144	3	Breed Studies A.H. 203	2
Qualitative Analysis Chem. 103	4	Organic & Quant. Chem. 255	3	Organic & Quant. Chem. 256	3
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Extempore Speaking P.S. 311	2	Mathematics Math. 205	4	Physics Phys. 204	3
Military 221	1	Military 222	1	Military 223	1
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Tech. Lect., Agron. 201, 202, 203.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

JUNIOR YEAR

Gen. Plant Physiology Bot. 205	4	General Bacteriology Bact. 304A	5	Crop Breeding F.C. 504	4
Agricultural Geology Geol. 375	3	Farm Machinery A.E. 334	4	Gen. Plant Pathology Bot. 207	4
Embryogeny Bot. 404	3	General Genetics Gen. 300	3	Farm Insects Zool. 374	4
Technical Journalism T.Jl. 225	3	Electives	5	Electives	5
Electives[4]	4				
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Tech. Lect., Agron. 301, 302, 303.

SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Soil Management Soils 454	3	Soil Bacteriology Soils 564	5	Animal Feeding A.H. 414	5
Rural Sociology Ec. 386	3	Economic History Hist. 324	3	American Government Govt. 315	3
Early 19th Century Engl. 254	3	Electives	9	Electives	9
Electives[4]	8				
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Tech. Lect., Agron. 401, 402, 403.

[4]The curriculum in Agronomy offers a considerable number of electives in the Junior and Senior years. This provision enables a student to take several elective courses in some other line of agriculture or allied science and thus prepare himself for special work in a chosen field or for an advanced degree in that field. Electives must be chosen in consultation with the counselor, and the student should elect at least 10 hours in Farm Crops and Soils and at least 15 hours in some closely allied science lines such as Entomology, Chemistry, Plant Pathology, Geology, Rural Sociology, etc., or in some agricultural lines such as Vocational Education, Agricultural Economics, etc. Free electives may be chosen for the remaining 15 hours available.

The following electives are suggested for students who plan to pursue graduate studies later: M.L. 411, 412, 413 or 441, 442, 443; Math. 405, 406; Physics 211, 212, 213; Chem. 201, 202, 274; Bot. 206, 405, 406, 554.

Description of Courses

For description of non-collegiate courses, see page 289.

Agronomy

110. **Technical Lecture and Seminar.** Problems in farm crops and soils are presented and discussed. Freshman Year. Spring. Required.

201, 202, 203. **Technical Lecture and Seminar.** Continuation of 110. Sophomore Year. Required.

301, 302, 303. **Technical Lecture and Seminar.** Continuation of 203. Junior Year. Required.

401, 402, 403. **Technical Lecture and Seminar.** Continuation of 303. Senior Year. Required.

Farm Crops Group

104. **Crop Production.** Fundamental underlying principles of crop production; world crop distribution with causes; growth processes; crop plant response to environment. Fall, Winter. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

105. **Crop Production.** The principles considered in 104 are applied in a specific study of corn and small grains including their distribution, use, improvement, growth, harvesting and marketing. Prerequisite: 104. Winter, Spring. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

204. **Crop Seed.** Seed as related to yield. Selection, improvement, showing, and judging farm seed. Prerequisite: 105. Winter. Rec. 1. Rec. and lab. 2, 2 hr. Credit 3.

214 **Forage Crops.** Grasses, legumes and other plants used for forage, pasture, silage, soiling and green manures. Prerequisite. 105. Fall, Spring. Rec. 3. Rec and lab 1, 2 hr. Credit 4.

304, 305. **Commercial Crop Judging and Grading.** Judging and grading cereal and forage crops, with particular emphasis on market classes and grades. (304) Prerequisite: 204. Spring. Rec. and lab. 3, 2 hr. Credit 3. (305) Prerequisite: 304. Fall. Rec. and lab. 2, 2 hr. Credit 2.

324. **General Farm Crops.** Underlying causes of world, United States, and Iowa crop distribution; growth processes and requirements of crop plants; production and use of grain and forage crops. Fall. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

344. **Seed Analysis.** (Bot. 344.) Principles and practices of purity analyses; identification, classification, and characteristics of seeds in different families. Prerequisite: Bot. 102. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

404. **Hay and Pasture Crops.** Major problems connected with meadow and pasture management. Specific grass, legume, and miscellaneous crops for forage purposes. Prerequisite: 105. Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

410. **Agricultural Travel Course.** (A. H. 410) A tour and study of the major livestock and crop regions of the United States. The influence of climate, soil, topography, markets, and other factors on the livestock and crops produced. Methods of production and management. A few days will be required for a preliminary study prior to the trip. At the end of the tour some time will be devoted to a summary and review. Summer, first term. Credit 8 or may be divided equally with A.H. 410.

414. **Crop Management.** Solution of practical crop problems through the application of investigational data available. Prerequisite: 214. Winter. Rec. 3. Credit 3.

424. **Fiber, Sugar, and Root Crops.** Production and manufacture of cotton, flax, sisal, and other fibers; also sugar beets, sugar cane, mangels and other root crops. Prerequisite: 105. Spring. Rec. 2. Credit 2.

435. **Problems in Farm Crops.** Prerequisite. 204, 214. Fall Credit 3 to 6.

445. **Seed Viability.** (Bot. 445.) Principles and practices of seed germination. Factors affecting viability; physiology of germination. Prerequisite: Bot. 205. Winter. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

504. **Cereal and Forage Crop Breeding.** The application of principles of genetics and allied subjects to the improvement of field crops. Prerequisite: Gen. 300. Spring. Rec. 3. Rec. and lab. 1, 2 hr. Credit 4.

546. **Seed Borne Diseases.** (Bot. 546.) Detection, identification, and control of parasitic organisms carried by crop seeds. Prerequisite: Bot. 207. Spring. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

604. **Research Methods in Crop Investigations.** Planning, conducting, and interpreting research work in field crops Winter. Rec. 3. Credit 3. Mr. Wentz.

605. **Taxonomy of Field Crops.** The identifying characters of field crops and their varieties with practice in classification. Winter. Rec. and lab. 2, 2 hr. Credit 2. Mr. Hughes.

606. **Principles of Crop Production.** A critical survey of the theories and scientific principles involved in the growing and improvement of farm crops. Spring. Rec. 3. Credit 3. Mr. Henson.

640. **Research.**
A. Crop Production. Mr. Hughes, Mr. Henson.
B. Crop Breeding. Messrs. Wentz, Burnett, Bryan.

645. **Conferences.** Reports and discussions on current investigations. Fall, Winter, Spring. Credit 1 each quarter.
A. Crop Production. Mr. Hughes.
B. Crop Breeding. Mr. Wentz.

Soils Group

254. **Soils.** Identification, mapping, and description of soil types, origin and classification. Soil areas, types, and problems in Iowa. Fall, Spring. Rec. 2. Lab. 2, 2 hr. Credit 3.

354. **Soil Fertility and Fertilizers** General principles of fertility Studies on samples of soil from the home farm, commercial fertilizers, incomplete and complete, influence on soil fertility. Prerequisite. 254, Chem. 255, or equivalent and credit or classification in Chem 256 or 253 when required in the curriculum. Winter, Spring. Rec. 3. Rec. and lab. 2, 2 hr Credit 5.

364. **Soils and Soil Fertility.** Origin and classification of soils; principles of fertility and a study of fertilizer requirements of soils. Fall, Winter, Spring. Rec. 3. Credit 3.

374. **Forest Soils.** Physical, chemical, and biological soil factors affecting forest growth. Prerequisite: 254. Fall. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

454. **Soil Management.** Productiveness of particular types or classes of soils; utilization; soil conservation; special soils. Prerequisite: 354. Fall, Spring. Rec. 3. Credit 3.

464. **Soil Conservation and Erosion Control.** Fundamental principles involved in the conservation of the land and in the prevention and control of erosion, as applied to Iowa. Prerequisite: 254. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

474. **Field Study of Soils.** Field work in five or six locations in Iowa in the different soil areas to study soil type characteristics by profiles, to map selected areas, certain farms and eroded lands and to evaluate land from the soils standpoint. Prerequisite: 254. Summer, first term. Credit 8.

475. **Problems in Soils.** Prerequisite: 354. Spring. Credit 3 to 6.

554. **Advanced Soils.** Classification of soils, constitution and formation of the soil profile and the properties of the clay and organic matter complexes. Prerequisite: 354. Fall. Rec. 3. Credit 3. Mr. Smith.

564. **Soil Bacteriology.** (Bact. 564.) Occurrence and activities of soil bacteria and their influence on soil fertility. Prerequisite: Bact. 304A and credit or classification in 354. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5.

654. **Advanced Soil Physics.** Physical characteristics of soils. Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3. Mr. Smith.

664. **Advanced Soil Fertility.** Influence of various factors on the productive power of soils. Fertilizing materials and their effect on soils. Winter. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5. Mr. Smith.

674. **Advanced Soil Bacteriology.** (Bact. 674.) The occurrence and activities of bacteria, molds, protozoa, and algae in soils and their functions. Spring. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5. Mr. Walker.

684. **Advanced Soil Management.** Systems of soil management and management problems. Winter. Rec. 3. Credit 3. Mr. Brown.

690. **Research.**
A. Soil Bacteriology (Bact. 690A). Mr. Brown, Mr. Walker.
B. Soil Fertility. Mr. Brown, Mr. Smith.
C. Soil Physics and Soil Surveying. Messrs. Brown, Firkins, Richards.
D. Soil Management. Mr. Brown, Mr. Stevenson.

695. **Conferences.** Reports and discussions on current investigations. Fall, Winter, Spring. Credit 1 each quarter.
A. Soil Bacteriology. (Bact. 695A.) Mr Brown.
B. Soil Fertility. Mr. Brown.
C. Soil Physics. Mr. Brown.
D. Soil Management. Mr. Brown.

ANIMAL HUSBANDRY

P. S. SHEARER, Head of Department

Professors Cannon, Helser, Henderson, LaGrange, Lush, Thomas; Associate Professors Anderson, Caine, Hansen, Wilcke; Assistant Professors Beard, Espe, Holbert, Waters; Instructor Milby; Graduate Assistant Ingle; Fellow Hillier

Extension Workers Arnold, Beresford, Johnston, McDonald, Quaife, Porter, Schultz, Vernon, Whitfield

For information concerning the Division of Agriculture, see page 58.

The department of Animal Husbandry offers instruction and carries on experimental work in the selection, breeding, feeding, management, and marketing of the various breeds and classes of farm animals, in the killing of meat animals, and in cutting and curing of meats.

The work of the department is divided into three main groups: Animal Husbandry, Dairy Husbandry, and Poultry Husbandry. Students

have the opportunity to make a choice of their major line of work from these three groups. There are sufficient elective hours for a minor in related fields as agricultural economics, agronomy, vocational education, technical journalism, chemistry, and others.

Graduates in animal husbandry find employment in many lines of work. A few of the many branches open to such graduates are: stock farm management, college work, experiment station work, government work, extension work for colleges, railroads, and breed associations, positions as county agents, agricultural high school work, agricultural journalism with particular reference to livestock, sales positions with commission firms, buying for packers, selling feed stuffs and stock farm equipment.

Some of the openings for graduates who have specialized in dairy husbandry are: dairy farm management, college and experiment station work, positions in United States Department of Agriculture, extension work, county and club agents, high schools, breed association work, agricultural journalism with particular reference to dairy cattle, management and sales positions with firms handling feed stuffs and dairy farm equipment.

Graduates of the Poultry Industry curriculum are in demand in the produce packing industry and as commercial hatchery managers.

Poultry Husbandry graduates are especially fitted for turkey, chicken, or game farm managers. Graduates of either curriculum may find opportunities in government research, state college experiment station or extension work; as technical specialists with poultry feed, equipment, or incubator manufacturers; with railroads, large land operators, or farm magazine publishers.

Curriculum in Animal Husbandry

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 117.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Livestock Problems A.H. 101[1]	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Livestock Management A.H. 125	2	General Chemistry Chem. 101	4	General Chemistry Chem. 102	4
Crop Production F.C. 104	4	Crop Production F.C. 105	4	Farm Mechanics A.E. 254	2
General Botany Bot. 101	3	General Horticulture Hort. 114	3	Farm Dairying D.I. 114	4
Military 121	1	Military 122	1	Military 123	1
	15		17		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., A.H. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Breeds of Livestock A.H. 201	3	Breeds of Livestock A.H. 202	3	Breeds of Livestock A.H. 203	2
(1) Poultry Husbandry A.H. 144	3	(3) Mathematics Math. 205	4	(4) Farm Meats A.H. 270	3
General Chemistry Chem. 103	4	Organic and Quant. Chem. 255	3	Organic and Quant. Chem. 256	3
(2) Anat. Dom. Animals Vet.Anat. 217	3	General Zoology Zool. 114	3	General Zoology Zool. 115	3
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Military 221	1	Military 222	1	(5) Physics Phys. 204	3
				Military 223	1
	17		17		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

(1) A.H. 144—Offered Fall, Winter, Spring.
(2) Two-thirds of Sophomore students will take Vet.Anat. 217 in Fall and one-third in Winter.
(3) Two-thirds of the students will take Math. 205 in Fall and one-third in Winter.
(4) A.H. 270—Offered Winter, Spring.
(5) One-third of the students will take Phys. 204 in Winter Quarter and Two-thirds in Spring.

JUNIOR YEAR

Animal Nutrition A.H. 318	3	General Bacteriology Bact. 304A	5	Livestock Judging A.H. 305	2
Comparative Physiology Vet.Phys. 364	3	General Genetics Gen. 300	3	Animal Breeding A.H. 350	3
Embryology Zool. 534	3	Fertility and Fertilizers Soils 354	5	Farm Machinery A.E. 334	4
Soils Soils 254	3	†Electives	4	Economic History Hist. 324	3
†Electives	5			Extempore Speaking P.S. 311	2
				†Electives	3
	17		17		17

SENIOR YEAR

Herd Book Study A.H. 460	3	Milk Production A.H. 434	2	Prod. & Mktg. of Beef Cattle A.H. 427	3
Market Classes & Grades of Livestock A.H. 409	2	Pork Prod. & Mktg. A.H. 425	3	Pasture and Hay Crops F.C. 404	3
Feed. & Mktg. of Horses A.H. 424	2	Farm Bldgs. & Equip. A.E. 489	3	American Government Govt. 315	3
Prod. & Mktg. of Sheep A.H. 429	2	Rural Sociology Ec. 386	3	†Electives	8
Soil Management Soils 454	3	†Electives	6		
†Electives	5				
	17		17		17

The curricula in Animal Husbandry, Dairy Husbandry, Poultry Husbandry, and Poultry Industry offer a considerable number of electives in Junior and Senior years. This provision enables a student to take several electives in some other line of agriculture or allied science and thus prepare himself for special work in a chosen field, or for work for an advanced degree in that field. Electives are to be chosen in conference with the senior college counselors and the head of the department. The department has prepared groups of elective sequences leading to definite objectives: as for example, a group of courses in Vocational Education and Psychology, Chemistry and Physiology, Agricultural Economics, English, Technical Journalism, Entomology, etc. Where such a sequence requires as much as 30 credits, the student with the consent of his counselor and classifying officer, and the approval of the Substitutions Committee may substitute for enough credits to make the sequence possible.

For information concerning the Reserve Officers' Training Corps, see page 244.

Curriculum in Dairy Husbandry

Leading to the degree of Bachelor of Science.

Dairy Husbandry freshmen and sophomores should register in the Dairy Husbandry curriculum. During the freshman and sophomore years they will take the same courses as the Animal Husbandry students. See page 122.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
General Bacteriology Bact. 304A	5	Rural Sociology Ec. 386	3	Adv. Study Dairy Breeds A.H. 335A	4
Comparative Physiology Vet.Phys. 364	3	Dairy Bacteriology D.I. 350	4	Animal Breeding A.H. 350	3
Embryology Zool. 534	3	General Genetics Gen. 300	3	Fertility and Fertilizers Soils 354	5
Soils Soils 254	3	Extempore Speaking P.S. 311	2	Economic History Hist. 324	3
Electives	3	American Government Govt. 315	3	Electives	2
		Electives	2		
	17		17		17

SENIOR YEAR

Animal Nutrition A.H. 318	3	Dairy Farm Problems A.H. 536	5	Manufacture of Butter D.I. 304	5
Feeding and Mktg. Horses A.H. 424	2	Seminar A.H. 439	1	Market Milk D.I. 305	3
Commercial Dairying D.I. 406	4	Pork Prod. & Mktg. A.H. 425	3	Pasture and Hay Crops F.C. 404	3
Soil Management Soils 454	3	Electives	8	Electives	6
Milk Secretion A.H. 535	2				
Electives	3				
	17		17		17

Curricula in Poultry Husbandry and in Poultry Industry

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 117.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Poultry Husbandry A.H. 144[1]	3	Management of Poultry A.H. 145	3	Packing Plant Problems A.H. 146	3
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
Farm Dairying D.I. 114	4	Farm Mechanics A.E. 254	2	Livestock Problems A.H. 103	2
Military 121	1	General Zoology Zool. 114	3	General Zoology Zool. 115	3
		Military 122	1	Military 123	1
	15		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., A.H 110 (Spring); Orientation Ag. 101, 102; Ag. 104, see page 117.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Poultry Judging A.H. 244	3	Hatchery Operations A.H. 245	3	Brooding A.H. 246	
Organic and Quant. Chem. 251** or 255*	3	Organic and Quant. Chem. 252** or 256*	3	Bio-Chemistry **Chem. 253 or	3
Princ. of Economics **Ec. 201 or Gen. Agr. Economics *Ec. 231	3	Princ. of Economics **Ec. 202 or Gen. Agr. Economics *Ec. 232	3	Farm Meats *A.H. 270 Princ. of Economics **Ec. 203 or Gen. Agr. Economics *Ec. 233	3
Extempore Speaking P.S. 311	2	General Botany *Bot. 101 or			
Anat. of Dom. Animals Vet.Anat. 217	3	Milk Test. & Inspect. **D.I. 116	3	Elementary Accounting Ec. 370	3
Livestock Problems *A.H. 101 or Electives	2	Livestock Problems *A.H. 102 and General Horticulture *Hort. 114 or Dairy Machinery **A.E. 239	5	Mathematics Math. 205	4
Military 221	1	Military 222	1	Military 223	1
	17		18		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

*For Poultry Husbandry students.
**For Poultry Industry students.

JUNIOR YEAR

Comp. Physiology Vet.Phys. 864	3	Incubation A.H. 345	3	Poultry Nutrition A.H. 546	3
General Bacteriology Bact. 304A	5	Rural Sociology Ec. 386	3	Sp. Poultry Bact. Bact. 574	3
General Farm Crops F.C. 324	4	Animal Nutrition *A.H. 318 or	3	Soils *Soils 254 or	
Physics Phys. 204	3	Dairy Bacteriology **Bact. 350	or 4	Creamery Acctg. **Ec. 330	3
Electives	3	Embryology Zool. 234	4	Manuf. of Butter **D.I. 304 or	5
		Food Chemistry **Chem. 345 or	4 or	Electives Market Milk	
		*Electives	3	**D.I. 305 or Electives	3
	18		17		17

*For Poultry Husbandry students.
**For Poultry Industry students.

SENIOR YEAR

Market Poultry A.H. 440	4	Poultry Breeding A.H. 548	3	Commercial Poultry Prod. A.H. 449	3
General Genetics Gen. 300	3	Economic History Hist. 324	3	Technical Advertising T.Jl. 325	2 or 3
Poultry Seminar A.H. 541	1	Poultry Seminar A.H. 542	1	Poultry Seminar A.H. 543	1
American Government Govt 315	3	*Fertility and Fertilizers Soils 354	5	Poultry Sanitation Vet.Hyg. 428	2
Electives	6	Electives	5	Electives	9 or 8
	17		17		17

Electives for Poultry Industry students: Agr. Engineering 157; Bacteriology 534, 585, 587; Chemistry 347; Economics 365, 234, 304, 335, 366, 374, 474; English 205, 404, 405; Mathematics 101, 102A, 103, 211, 212, 213, 441, 442, 443; Public Speaking 312, 334.

Combined Curriculum in Animal Husbandry, Dairy Husbandry, or Poultry Husbandry, and Veterinary Medicine

See the Dean of Veterinary Medicine and the Head of Animal Husbandry.

Description of Courses

For description of non-collegiate courses, see page 289.

101. **Livetock Problems.** The relation of livestock to agriculture and to human needs. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. Beef and dual-purpose cattle. (A) For students who have not had one year of vocational or 4-H Club training. Fall. (B) For students who have had at least one year of 4-H Club or vocational training. Fall. Rec. and lab. 2, 2 hr. Credit 2.

102. **Livestock Problems.** Sheep and horses. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. (A) For students who have not had one year of vocational or 4-H Club training. (B) For students who have had at least one year of vocational or 4-H Club training. Winter. Rec. and lab. 2, 2 hr. Credit 2.

103. **Livestock Problems.** Dairy cattle and hogs. Selection, judging, carcass studies, markets, market classification, feeding, breeding, and management. Spring. Rec. and lab. 2, 2 hr. Credit 2.

107. **Market and Breed Types of Beef, Dairy and Dual-Purpose Cattle, Sheep, Horses and Hogs.** Judging and selection. Spring. Rec. and lab. 6, 2 hr. Credit 6.

110. **Technical Lecture.** A survey of the field of Animal Husbandry. For Freshman Animal Husbandry students. Spring. Lect. 1. Required.

125. **Livestock Management.** Fitting for show and sale. Fall, Spring. Lect. and lab. 2, 2 hr. Credit 2.

144. **General Poultry Husbandry.** Principles of managing a farm flock. Selection of breeds, culling, fitting, judging, and housing. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

145. **Management of Poultry.** Studies of the production of turkeys, ducks, geese, pheasants, capons, and other fowl; their origin, habits, and utility. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

146. **Poultry Packing Plant Problems.** Factors affecting the quality of market poultry and eggs. Grading and candling eggs. Prerequisite: 144. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

201, 202, 203. **Breeds of Livestock.** Breeds, their use and adaptability in commercial livestock production. (201) Dairy cattle and hogs. Prerequisite: 103. Fall. Lect. 1. Rec. and lab. 2, 2 hr. Credit 3. (202) Sheep and horses. Prerequisite: 102. Winter. Lect. 1. Rec. and lab. 2, 2 hr. Credit 3. (203) Beef and dual-purpose cattle. Prerequisite: 101. Spring. Rec. and lab. 2, 2 hr. Credit 2.

205. **Breeds of Livestock.** Their use and adaptability in commercial livestock production. Prerequisite: 101, 102, 103. Fall. Lect. 1. Rec. and lab. 3, 2 hr. Credit 4.

244. **Poultry Judging.** History and development of breeds and varieties. Prerequisite: 145, 146. Fall. Rec. 1. Lab. 3, 2 hr. Credit 3.

245. **Hatchery Operation.** Practice in operating mammoth incubators. Principles of modern hatchery management. Selecting, boxing, and shipping chicks. Prerequisite: 244. Winter. Rec. and lab. 6 hrs. Credit 3.

246. **Brooding.** Principles and practices; study of brooders and principles and practices of artificial brooding. Prerequisite: 146. Spring. Rec. 2 for first 8 weeks of quarter. Lab. 4 weeks, 1 hr. daily. Credit 3.

270. **Farm Meats.** The selection and killing of meat animals and the cutting and curing of farm meats. Prerequisite: Vet. Anat. 217. Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

305. **Livestock Judging.** Horses, beef cattle, sheep, and hogs. Prerequisite: 201, 202, 203, and Vet. Anat. 217. Spring. Lect. and lab. 2, 2 hr. Credit 2.

318. **Animal Nutrition.** Fundamental basis of nutrition; practical methods; nutritive ratios and feeding standards. Prerequisite: Chem. 253 or 256, and Vet. Anat. 217. Credit or classification in Vet. Phys. 364. Fall, Winter. Lect. 3. Credit 3.

334. **Dairy Farm Practice.** Practical problems of breeding, feeding, and management. Open by permission to men doing cow testing association work. Credit given after satisfactory completion of one year's work as tester in a cow testing association in Iowa. Prerequisite: 101, 102, 103, and D. I. 114. Credit 6.

335. **Advanced Study of the Dairy Breeds.** Judging, compiling pedigrees, selection of breeding animals, studies of important strains and families, trips to dairy cattle farms. Prerequisite: 201, Vet. Anat. 217. (A) Spring. Rec. 2. Lect. and lab. 2, 2 hr. Credit 4. (B) Spring. Lect. and lab. 2, 2 hr. Credit 2.

337. **Dairy Cattle Feeding and Management.** For Dairy Industry students. Feeding, care, management, and development of dairy cattle; methods of milk production. Prerequisite: Chem. 175 or 251. Fall. Rec. 3. Credit 3.

344. **Special Poultry Problems.** Experimentation, technique, practice. Prerequisite: credit or classification in 15 hrs. of poultry husbandry. Fall, Winter, Spring. Credit 3.

345. **Incubation.** Factors affecting the development and hatching of avian embryos. Prerequisite: 245, credit or classification in Zool. 234 or 534. Rec. 2. Lab. ½ hr. daily. Credit 3.

350. **Animal Breeding.** Application of principles of genetics to improvement of farm animals; methods and problems of the breeder. Prerequisite: 201, 202, 203, Zool. 534, and Genetics 300. Winter, Spring. Lect. 3. Credit 3.

374. **Farm Meats.** For Home Economics students. Selecting, cutting, and curing of meat in the farm and city home. Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

376. **Farm Meats.** For Junior and Senior Veterinary students. The selection and killing of meat animals and the cutting and curing of farm meats. Prerequisite: 107, Vet. Anat. 213. Spring. Lect. 1. Lab. 1, 3 hr. Credit 2.

405. **Advanced Live Stock Judging.** Horses, beef cattle, sheep, and hogs. Trips to shows and stock farms. Prerequisite: 305. Fall. Lab. 6 hrs. Credit 2.

409. **Market Classes and Grades of Livestock.** Classifying, grading, and valuing horses, cattle, sheep and hogs from the standpoint of the open market. Prerequisite: 101, 102, 103, and Vet. Anat. 217. Fall. Lect. and lab. 3, 1 hr. Credit 2.

410. **Agricultural Travel Course.** (F. C. 410.) A tour and study of the major livestock and crop regions of the United States. The influence of climate, soil, topography, markets, and other factors on the livestock and crops produced. Methods of production and management. A few days will be required for a preliminary study, prior to the trip. At the end of the tour some time will be devoted to a summary and review. Summer, first term. Credit 8, or may be divided equally with F. C. 410.

414. **Animal Feeding.** Composition and digestibility of feeding stuffs; preparation; feeding standards and calculation of rations; management of herds and flocks Prerequisite: Chem. 255, or equivalent. Spring. Lect. 5. Credit 5.

416. **Animal Feeding.** Similar to 414. Prerequisite: Chem. 107, 174, 251, or 255 Rec. 3. Credit 3. Spring.

424. **Feeding and Marketing of Horses.** Problems Prerequisite: 318 and Vet Phys. 364. Fall. Rec. 2. Credit 2.

425. **Pork Production and Marketing.** Prerequisite· 318, Vet. Phys. 364. Winter Lect. 3. Credit 3.

427. **Beef Cattle Production and Marketing.** Prerequisite· 318, Vet Phys 364 Spring. Lect. 3. Credit 3.

429. **Mutton and Wool Production and Marketing.** Prerequisite· 318, Vet Phys 364. Fall. Lect. 2. Credit 2.

430. **Special Problems in Dairy Husbandry.** Open to students who can show satisfactory preparation for the problem chosen and who have earned a quality point average of 2.5 or above for the two preceding quarters. Individual topic, conferences, and preparation of a report. Fall, Winter, Spring. Credit 3 each quarter.

434. **Milk Production and Herd Management.** For Animal Husbandry students. Preparation of feeds; computing rations for milking herd, young stock, and sire Management of specialized and general dairy farms. Prerequisite: 318. Winter. Rec. 2. Credit 2.

439. **Dairy Husbandry Seminar.** For Seniors. Selected subjects; recent investigations. Winter. Credit 1.

440. **Marketing of Poultry and Eggs.** Fattening, killing, dressing, grading, and shipping market poultry and candling, grading, and packing eggs for shipment. Trips to commercial plants and study of poultry packing plant operation. Prerequisite: 146. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

449. **Commercial Poultry Production.** Practical problems. Plans, development, and organization of commercial poultry farms. Visits to several commercial poultry farms required. Prerequisite: 345. Alternate years. Offered Spring, 1937. Lect. 2. Lab. 1, 3 hr. Credit 3.

454. **Principles of Breeding.** Physical basis of heredity; Mendelism; livestock breeding. Prerequisite: 101, 102, 103, or 107. Fall. Lect. 3. Credit 3.

460. **Herd-Book Study.** Pedigrees, blood lines and families in various breeds of livestock. Prerequisite: 201, 202, 203; credit or classification in 350. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3.

475. **Meats and Meat Products.** For Home Economics students. Special problems in the judging, buying, and handling of meats. Prerequisite: 374 or equivalent. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

480. **Animal Husbandry Seminar.** For Senior Animal Husbandry students. Practical investigations covered. Selected review topics. Spring. Rec. 2. Credit 2.

490. **Special Problems in Animal Husbandry.** Open to students who can show satisfactory preparation for the problem chosen and who have earned a quality point average of 2.5 or above for the two preceding quarters. Individual topic, conferences, and preparation of a report. Fall, Winter, Spring. Credit 3 each quarter.

535. **Milk Secretion.** Principles of nutrition in their relation to milk secretion. Prerequisite: 318, Vet. Phys. 364. Fall. Rec. 2. Credit 2.

536. **Dairy Farm Problems.** Production of milk; care, feeding, housing, and management of dairy cattle with experimental results and their application to dairy husbandry. Prerequisite: 318, 350. Winter. Rec. 5. Credit 5.

541, 542, 543. **Poultry Seminar.** Reviews and reports of current literature and investigations. Fall, Winter, Spring, respectively. Credit 1 each course.

546. **Poultry Nutrition.** Experimental work; poultry rations; egg production, development of young stock. Prerequisite: 146, Chem. 256, Vet Phys. 364. Alternate years. Offered Spring, 1937. Lect. 1. Lab. 2, 3 hr. Credit 3.

548. **Poultry Breeding.** Principles of genetics as applied to poultry. Inheritance of commercial factors including size of body, size of egg, egg production, hatchability of eggs, and viability of chicks. Breeding records and pedigreeing. Selection and mating of breeding hens. Prerequisite: 345, Gen. 300. Alternate years. Offered Winter, 1937. Lect. 2. Lab. 1, 3 hr. Credit 3.

600. **Research in Animal Nutrition.** Mr. Thomas, Mr. Culbertson.

605. **Conference in Experimental Methods in Animal Husbandry.** Research methods, selection of problems, planning of experimental work, execution of program, interpretation of results and presentation of material. Fall, Winter, Spring. Credit 2. Mr. Culbertson.

614. **Seminar in Animal Nutrition.** Prerequisite: Chem. 575 or equivalent. Fall, Winter, Spring. Credit 1. Mr. Thomas.

615. **Research in Animal Production.** Messrs. Shearer, Caine, Anderson, Culbertson.

630. **Dairy Husbandry Experimentation.** Experimental methods, criticism of problems. Fall. Credit 1. Mr. Cannon.

638. **Research in Dairy Husbandry.** Messrs. Cannon, Hansen, Espe.

640. **Research in Poultry Husbandry.** Mr. Henderson, Mr. Waters.

650. **Research in Animal Breeding.** Mr. Lush, Mr. Shearer.

651, 652, 653. **Conferences on Animal Breeding Systems.** (Gen. 651, 652, 653.) Biometric relations between parent and offspring, inbreeding and outbreeding, assortative mating, the effects of selection. Application of these principles to progeny tests, selection indices, records of performance, etc. Prerequisite: 350, Gen. 600, or equivalent. Fall, Winter, Spring, respectively. Credit 2. Mr. Lush.

670. **Research in Meats.** Mr. Helser.

680. **Seminar.** Weekly meetings with staff. Fall, Winter, Spring. Credit 1. Messrs. Cannon, Lush, Thomas.

ARCHITECTURAL ENGINEERING

A. H. KIMBALL, Head of Department

Associate Professor Bowers; Assistant Professors Phillips, Pratt; Instructors Ayres, Woody

For information concerning the Division of Engineering, see page 63.

The curriculum in Architectural Engineering is designed to meet the growing demand for training in the fundamentals of engineering problems found in connection with architectural work and a knowledge of the aesthetic treatment of structures. It gives a groundwork in mathematics and applied mechanics, and includes such studies as strength of materials, mill, and tall building construction, reinforced concrete, etc. The principles of these subjects are applied to all forms of building construction in the work of the junior and senior years. While specializing in construction, this curriculum includes also the study of the

forms and principles of architecture through such courses as freehand drawing, architectural history, architectural drawing, and architectural design.

In all professional work, the methods of instruction are, as far as possible, individual. Design is taught on the basis of problems requiring a solution, development and presentation by the student under criticism, accompanied by short problems to be carried out, with no criticism until all problems are turned in. The problems are treated from three standpoints; namely: practical planning, economic use of materials, and aesthetic treatment. In all cases, student design problems are graded by a jury consisting of the entire staff of the department.

Nine quarter credits of elective work are permitted in both the junior and senior years. The choice of the electives is to be made in consultation with the student's counselor and the head of the department. Certain sequences will then be arranged to fit the individual requirements of the student and care will be exercised in order to use the time to the best advantage.

The training offered in the curriculum is such as to provide men with the best possible foundation for responsible positions in the profession.

All drawings and designs made during the curriculum become the property of the department to be retained, published, exhibited, or returned at the discretion of the department.

Curriculum in Architectural Engineering

Leading to the degree of Bachelor of Science.

For graduate work, see page 88.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Freehand Drawing Arch.E. 114	2
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Project. Draw. Engr. Dr. 132	3	Freehand Drawing Arch.E. 115	1
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1	Architectural Drawing Arch.E. 108	2
				Shades, Shadows and Perspective Arch.E. 109	2
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule :Phys.Ed. 101, 102, 103; Engr. 114, 115; Lib. 106C (Winter); Arch.E. 100 (Spring).

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Elements & Composition Arch.E. 271A	2	Arch. Engr. Design Arch.E. 272A	3	Arch. Engr. Design Arch.E. 273A	3
Freehand Drawing Arch.E. 221	1	Freehand Drawing Arch.E. 222	2	Freehand Drawing Arch.E. 232	1
Surveying C.E. 325	3	Freehand Drawing Arch.E. 231	1	Statics of Engineering T.&A.M. 274	3
Expository Writing *Engl. 204	2	Extempore Speaking *P.S. 311	2	Engineering Problems Gen.E. 206	1
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

JUNIOR YEAR

History of Architecture Arch.E. 351	3	History of Architecture Arch.E. 352	3	History of Architecture Arch.E. 353	3
Arch. Engr. Design Arch.E. 381A	4	Arch. Engr. Design Arch.E. 382	4	Arch. Engr. Design Arch.E. 383	4
Mechanics of Materials T.&A.M. 324	5	Elements of Structures C.E. 335	5	Industrial Buildings C.E. 336	5
Materials Laboratory T.&A.M. 327	1	Principles of Economics Ec. 261	3	Cement and Concrete T.&A.M. 338	3
Properties of Materials T.&A.M. 334	2	Electives	3	Electives	3
*Electives	3				
	18		18		18

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior and Senior years.

Junior elective courses shall be chosen, after consultation with the counselor, from the following approved sequences: C.E. 321, 322, 323; Govt. 315, 424, 435; Hist. 234, 235, 421; Military 301, 302, 303; Mod.Lang. 441, 442, 443; Psych. 204, 334, 424; Arch.E. 234, 235, 236; Arch.E. 325, 326, 327; T.Jl. 225, 335, 325.

SENIOR YEAR

Commercial Bldg. Design Arch.E. 491	4	Building Construction Arch.E. 492	5	Special Bldg. Problems Arch.E. 493	4
Reinforced Concrete C.E. 437	5	Multistory Buildings C.E. 438	3	Professional Relations Arch.E. 494	3
Mech. Equip. of Bldgs. M.E. 407	3	Mech. Equip. of Bldgs. M.E. 409	3	Adv. Struct. Analyses C.E. 439	5
City or Town Planning L.A. 401	3	Engineering Contracts Engr. 405	3	Seminar Arch.E. 495	R
*Electives	3	Electives	4	Engineering Valuation Engr. 407	3
				Electives	3
	18		18		18

The Senior electives shall be chosen from the following list: E.E. 355—Electrical Application in Buildings; Ec. 374—Accounting; Military 401, 402, 403; C.E. 404—Engineering in City Planning; L.A. 402—Institutional Planning; L.A. 403—Recreational and Regional Planning; Cer. 424—Decorated and Decorative Structural Material; T.&A.M. 514, 515, 516—Advanced Mechanics of Materials; T.&A.M. 498—Construction Materials; A.E. 375—Farm Structures; Geol. 374—Engineering Geology.

Description of Courses

100. **Technical Lectures.** Elementary principles of Architectural Engineering. Spring. Lect. 1. Required.

108. **Elementary Design.** Preparatory course in architectural design. Wash renderings. Design of single unit buildings or structures, rendered. Prerequisite: credit or classification in 109. Winter, Spring. Lab. 2, 3 hr. Credit 2.

109. **Shades, Shadows, and Perspective.** Shades and shadows,—first half of quarter. Architectural perspective,—second half of quarter. More complicated architectural forms measured and drawn in orthographic projection. Prerequisite: Engr. Dr. 132. Fall, Spring. Lab. 2, 3 hr. Credit 2.

114. **Freehand Drawing.** Elementary drawing of form in relation to space. Casts and solids are drawn in pencil and charcoal. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

115. **Freehand Drawing.** Form construction in charcoal of heads and architectural ornament. Prerequisite: 114. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

221. **Freehand Drawing.** Construction of movement, volume and space in drawing cast figures in charcoal; embodying problems suited to individual needs. Prerequisite: 115. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

222. **Freehand Drawing.** Advanced drawing and composition. Creating pictorial, decorative and architectural form. Casts, models, still life, etc., in charcoal or color. Prerequisite: 221. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

231, 232, 233. **Freehand Drawing.** Water color painting from landscape, models, and still life. Color theory and composition of color and form. Stressing individuality of creative work in various fields. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

234, 235, 236. **House Design.** Aesthetic principles of planning as applied to domestic architecture. Special consideration given to economic use of materials, methods of construction, and mechanical equipment. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3 each course.

271. **Elements and Composition.** Problems in the orders and elementary composition and planning rendered in wash and water color.

A. (For Arch. Engr. students.) Prerequisite: 109. Fall, Winter. Lab. 2, 3 hr. Credit 2.

B. (For Landscape Architecture students.) Fall. Lab. 3, 3 hr. Credit 3.

272, 273. **Architectural Engineering Design.** Continuation of 271. Conventional rendering. Problems illustrating the principles of architecture as applied to engineering structures.

A. (For Architectural Engineering students.) Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

B. (For Landscape Architecture students.) Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

324. **Freehand Drawing.** Drawing and picture organization in pen and ink from landscape and architectural subjects. Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

325. **Freehand Drawing.** Pencil sketching. Individuality and originality in the study of technique and composition of creative work in sketching landscape, etc. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

326. **Freehand Drawing.** Mediums suited to student needs in different departments, including lithography, etching, wood engraving, linoleum block, etc. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

327. **Freehand Drawing.** Advanced painting and drawing from many subjects, embracing plastic qualities giving specific appreciation in creative, pictorial, decorative and architectural thinking. Fall, Winter, Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3.

351, 352, 353. **History of Architecture.** Influence of past civilization. Evolution of architectural forms from the Egyptian period to modern times with their relation to and influence on allied arts. Readings, sketches, and reports. Fall, Winter, Spring, respectively. Lect. 2. Rec. 1. Credit 3 each course.

381. **Architectural Engineering Design.** Continuation of 273. Lab. 2 or 4, 3 hr. Credit 2 or 4.

A. (For Architectural Engineering students.) Fall. Credit 4.

B. (For Landscape Architecture students.) Winter. Credit 2.

382. **Architectural Engineering Design.** Continuation of 381. Prerequisite: 381. Winter, Spring. Lab. 4, 3 hr. Credit 4.

383. **Architectural Engineering Design.** Continuation of 382. Prerequisite: 382 Spring. Lab. 4, 3 hr. Credit 4.

384, 385, 386. **Principles of Architectural Design.** Elective for students other than those registered in the Curriculum in Arch. E. Problems in design dealing with simple architectural forms. Methods of presentation. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

491. **Commercial Building Design.** Planning of commercial structures with particular reference to industrial occupancy. Prerequisite: 383, C.E. 335. Fall. Lab. 4 to 7, 3 hr. Credit 4 to 7.

492. **Building Construction.** An extended study of scale and F. S. details of designs produced in 491. Prerequisite: 491. Winter. Lect. 1. Lab. 3 to 6, 3 hr. Credit 4 to 7.

493. **Special Building Design.** Advanced commercial and industrial structures treated from an aesthetic standpoint. Prerequisite: 492. Spring. Lect. 1. Lab. 3 to 6, 3 hr. Credit 4 to 7.

494. **Professional Relations, Specifications, and Estimating.** Relations of architect, owner, and builder. Office organizations; building ordinances; professional ethics. Methods of estimating. Prerequisite: classification in 491. Spring. Lecture 3. Credit 3.

495. **Seminar.** Preparation and extempore delivery of reports on building construction or other assigned topics. Prerequisite: senior classification. Spring. Required without credit.

600. **Advanced Design.** Design for graduate students in Architectural Engineering. Fall, Winter, Spring. Mr. Kimball.

604. **Research.** Mr. Kimball.

BACTERIOLOGY

R. E. BUCHANAN, Head of Department

Professors Brown, Hammer, Levine, Werkman; Associate Professor Merchant; Instructors Burns, McCleskey, Swingle; Fellows Mitchell, Powers

For information concerning the Division of Industrial Science, see page 69.

The department is housed on the first and second floors and the basement of Science Hall. This building was planned to furnish the best possible accommodations to bacteriological laboratories. The large general laboratory located on the second floor is well equipped with standard tables, lockers, sterilizers, autoclaves, incubators and microscopes. Well equipped laboratories for advanced work in general, food, sanitary, and physiological bacteriology and immunity are provided, with dispensing rooms, offices, classrooms, and research laboratories. The general laboratory on the second floor is designed for the needs of students in general bacteriology in such curricula as agronomy, dairy industry, forestry, horticulture, home economics, and sanitary engineering.

Research laboratories in sanitary bacteriology and for the Engineering Experiment Station are located on the second floor.

Research laboratories for the Agricultural Experiment Station and for the study of fermentations and immunity are located on the first floor and in the basement. Two large electrically controlled incubation rooms, especially constructed inoculating room and high temperature incubators are available. Equipment desirable for fermentation studies is adequate for fundamental and applied research.

Well equipped laboratories in soil bacteriology are housed with the Department of Soils on the first floor of Agricultural Hall and in dairy bacteriology on the second floor of the Dairy Industry Building.

The laboratories in veterinary bacteriology are well equipped for both undergraduate and graduate courses in bacteriology in its relationship to the diseases of animals.

Curriculum in Industrial Science—Major Bacteriology

This curriculum is designed to give fundamental training in general

and technical bacteriology such as will fit students to be agricultural bacteriologists, soil bacteriologists, dairy bacteriologists, veterinary bacteriologists, sanitary experts, sanitary bacteriologists, and experts in bacteriology as related to the home and to the industries.

For freshman and sophomore years, see page 226.

For junior and senior years, see page 227.

Description of Courses

224. **General and Pathogenic Bacteriology.** (Vet. Hyg. 224.) Morphology, classification, cultivation, and physiological characteristics of pathogenic bacteria; principles of infection and immunity. Fall. Rec. 4. Lab. 4, 3 hr. Credit 7.

225. **Pathogenic Bacteriology.** (Vet. Hyg. 225.) Detailed study of the bacteria associated with animal diseases. Continuation of Vet. Hyg. 224. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5.

304. **General Bacteriology.** Morphology, classification, physiology, and cultivation of bacteria; relation of bacteria to health of man, animals and plants, the home, sanitation, and industry.

A. For students in agronomy, animal husbandry, dairy industry, horticulture, technical journalism, and industrial science. Prerequisite: organic chemistry. Fall, Winter. Lect. and demonstrations 5. Lab. 2, 2 hr. Credit 5.

B. For students in home economics. Prerequisite: organic chemistry. Fall, Winter, Spring. Lect. and demonstrations 5. Lab. 2, 2 hr. Credit 5.

C. For students in forestry and chemical engineering. Prerequisite: organic chemistry. Spring. Lect. 3. Lab 1, 3 hr. Credit 4.

D. For students in engineering. Prerequisite: general chemistry. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.

350. **Dairy Bacteriology.** (D.I. 350.) Bacteria in milk and its derivatives; the production and handling of dairy products from the hygienic viewpoint. Prerequisite: Bact. 304A. Winter. Lect. 4. Lab 3, 2 hr. Credit 4 or 6.

404. **Special Problems.** Credit 1 to 5.

405. **Special Problems in Sanitary and Food Bacteriology.** Prerequisite: 304A and 534 or equivalent. Fall, Winter, Spring. Credit 3 to 8.

450. **Special Dairy Bacteriology.** (D.I. 450.) Laboratory investigations, assigned readings and reports on bacteriological problems relating to dairying. Prerequisite. 350. Fall, Winter, Spring. Credit 2 to 6.

534, 535. **Sanitary and Food Bacteriology.** (534) Micro-organisms in water supplies. Prerequisite: 304D or equivalent. Fall, Spring. Lect. 2. Lab. 1, 3 hr. Credit 3. (535) Bacteria, yeasts and molds in food products and the industries. Prerequisite: 534 or equivalent. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4.

536. **Laboratory Methods and Diagnosis.** Prerequisite: 304A or equivalent. Spring. Lect. 2. Lab. 6 or 9 hr. Credit 4 or 5.

537. **Municipal and Rural Sanitation.** Principles of water supply, sewage and garbage disposal, disinfection, air conditions, control of contagious diseases. Prerequisite: 304D or equivalent. Spring. Lect. 3. Credit 3.

554. **Bacteriology of Milk.** (D.I. 554.) The various problems in connection with the handling and supervision of milk supplies. Prerequisite: 350. Spring. Lect. 2. Credit 2.

555. **Laboratory work accompanying 554.** (D.I. 555.) Spring. Lab. 3, 2 hr. Credit 2.

556. **Bacteriology of Butter and Cheese.** (D.I. 556) The desirable and undesirable bacteriological changes occurring in cream intended for butter making and in butter and cheese. Prerequisite: 350. Fall. Lect. 2. Credit 2.

557. **Laboratory work accompanying 556.** (D.I. 557.) Fall. Lab. 3, 2 hr. Credit 2.

560. **Systematic Bacteriology.** History of bacterial classification, the International Rules of Nomenclature as applied to bacteria; development of a classification of bacteria based upon relationships. Prerequisite: 304A or equivalent Fall. Lect. 3. Credit 3.

561, 562, 563. **Seminar.** Required of all students taking major work in bacteriology. Fall, Winter, Spring, respectively. Credit 1 each quarter.

564. **Soil Bacteriology.** (Soils 564.) Occurrence and activities of soil bacteria and their influence on soil fertility. Prerequisite: Bact. 304A, and credit or classification in Soils 354. Winter. Rec. 3. Lab. 3, 2 hr. Credit 5.

571, 572, 573. **Seminar in Fermentations.** Fall, Winter, Spring, respectively. Credit 1 each quarter.

574. **Special Poultry Bacteriology.** Bacterial diseases in poultry, relationships of bacteria to storage of poultry and poultry products. Prerequisite: General Bacteriology. Spring. Rec. 2. Lab. 2, 2 hr. Credit 3.

575. **Immunity and Serum Therapy.** Theories of immunity and immunization; preparation of vaccines and antisera. Prerequisite: 304A. Winter. Lect. 3. Lab. 1, 3 hr. Credit 4.

631, 632, 633. **Physiology of Bacteria.** Characteristics of bacterial environments, influence of physical and chemical environment on changes produced by microorganisms; enzymes; fermentations. Winter, Spring, Fall, respectively. Lect. 3. With or without lab. 3 to 9 hr. Credit 3 to 6. Mr. Buchanan, Mr. Werkman.

655. **Conferences in Dairy Bacteriology.** (D.I. 655.) Discussions of bacteriological problems relating to the various phases of dairying. Spring. Lect. 2. Credit 2. Mr. Hammer.

656. **Identification of the Organisms Common in Dairy Products.** (D.I. 656.) Identification and relationships of the desirable and undesirable organisms commonly encountered in dairy products. Fall. Lect. 2. Lab. 3, 2 hr. Credit 4. Mr. Hammer, Mr. Hussong.

674. **Advanced Soil Bacteriology.** (Soils 674.) The occurrence and activities of bacteria, molds, protozoa, and algae in soils and their functions. Winter. Rec. 3. Rec. and lab. 2, 2 hr. Credit 5. Mr. Walker.

690. **Research.**

A. Soil Bacteriology. (Soils 690A.) Mr. Brown, Mr. Walker.
B. Pathogenic Bacteriology. (Vet. Hyg. 690B.) Prerequisite: 224 or equivalent. Mr. Murray.
C. Dairy Bacteriology. (D.I. 690C.) Prerequisite 350. Mr. Hammer, Mr. Olson.
D. General or Systematic Bacteriology. Messrs. Buchanan, Levine, Werkman.
E. Pathogenic Bacteriology. Prerequisite: 224 or equivalent Mr. Werkman.
F. Sanitary and Food Bacteriology. Prerequisite: 304, 534, or equivalent. Mr. Levine.
G. Physiology of Bacteria and Fermentations Mr Buchanan, Mr. Werkman.
H. Household Bacteriology Prerequisite 304B or equivalent. Messrs. Buchanan, Levine, Werkman.

695A. **Conferences in Soil Bacteriology.** (Soils 695A.) Reports and discussions on current investigations. Fall, Winter, Spring. Credit 1 each quarter. Mr. Brown

BOTANY

I. E. Melhus, Head of Department

Professors Bakke, Dietz, Gilman, Martin; Associate Professors Aikman, Loomis, Porter; Assistant Professors Hayden, Sass; Instructors Buchholtz, Kreutzer; Graduate Assistants Kent; Fellows Kohler, Raeder, Shubert; Extension Workers Layton, Porter, Sylvester

For information concerning the Division of Industrial Science, see page 69.

The Botany department offers instruction in all lines of scientific endeavor pertaining to plant life. A foundation for work in horticulture, farm crops, forestry, landscape architecture, home economics, and genetics is thus provided. It prepares men and women for teaching the various phases of botany and for doing research in the plant sciences. Many of the students majoring in the department find employment as teachers in high schools and colleges and as investigators in the United States Department of Agriculture, State Experiment Stations, and commercially and privately endowed research institutions.

The department is housed in the Botany Building. It is well equipped with laboratories for both undergraduate and graduate work in all the different phases of the botanical sciences. The department has 9,000 square feet of greenhouse space available for growing class material, student laboratory work with growing plants, and research by graduate students. Excellent equipment is available for research including a splendid herbarium of 180,000 specimens containing many rare collections

among the flowering plants and fungi. In addition, the college and agricultural experiment station grounds, consisting of 1990 acres, offer a wide range of living plant material growing in its native condition in the college woods, planted for ornamental purposes on the campus, and for experimental purposes on the experiment station plots.

Curriculum in Industrial Science—Major Botany

For freshman and sophomore years, see page 226.

For junior and senior years, see page 227.

Description of Courses

101, 102, 103. **General Botany.** (101) Growth response of seed plants. How seed plants make food, grow, differentiate, and reproduce. Fall, Winter, Spring. (102) The lower plants as to their structure, function, and sequence in development. Winter. (103) Plants in the field, their ways of living, relationship, and identification. Spring. Group conferences 3, 2 hr. Credit 3 each course.

205. **Elementary Plant Physiology.** Principles of absorption, conduction, transpiration, photosynthesis, respiration, growth, movement, and reproduction. Prerequisite: 101. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

206. **Systematic Botany.** Spring and summer flora. Historical survey of various systems of classification; principal groups by means of representatives. Prerequisite: 101. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

207. **General Plant Pathology.** Nature, cause, and control of diseases of field, orchard, and forest crops. Prerequisite: 205 except for Farm Management students. Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

254. **Native Trees and Shrubs.** Identification in field and laboratory. Prerequisite: 101. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

255. **Nature Study.** Materials, methods, aesthetic and economic aspects of plant life; for public school teaching. Plants in legend and folk-lore and their use by Indians and pioneers. Prerequisite: 101. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

256, 257. **Dendrology.** Families, genera and species of North American trees. (256) Angiosperms. Prerequisite. 206. Fall. Rec. 2. Lab. 2, 2 hr. and 2 hrs. in field. Credit 4. (257) Gymnosperms. Prerequisite: 206. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

344. **Seed Analysis.** (F. C. 344.) Principles and practices of purity analyses; identification, classification, and characteristics of seeds in different families. Prerequisite: 102. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

354. **Weed Identification and Control.** Economic importance and identification of weeds; principles and methods of control. Prerequisite: 205. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

404. **Embryogeny.** Cell structures, cell division, and the structural and functional relationships of the four divisions of the plant kingdom. Prerequisite: 101. Fall. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

405. **General Histology.** Origin and cellular structure of the tissues of the vegetative organs of seed plants. Prerequisite: 205. Winter. Rec. 1. Lab. and confer. 2, 3 hr. Credit 4.

406. **Plant Cytology.** Structure of the cell. Cytoplasm and its inclusions. The nucleus and its relation to genetic problems. Prerequisite: 404. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3.

414, 415. **Applied Mycology.** The fungi in relation to industry and agriculture. Prerequisite: Bact. 304. Fall, Spring, respectively. Rec. 2. Lab. 1, 3 hr. Credit 3 each course.

416. **Forest Pathology.** The life histories, influence of environmental conditions, pathogenicity, and control measures of forest disease pathogens, and micro-organisms attacking lumber. Winter. Prerequisite: 205. Rec. 2. Lab. 2, 3 hr. Credit 4.

424. **Ecology.** Native and crop vegetation in relation to factors of the environment, application to forestry, grazing, and general plant production. Prerequisite: 205. Fall. Rec. 2. Lab. 1 or 2, 3 hr. Credit 3 or 4.

445. **Seed Viability.** (F. C. 445.) Principles and practices of seed germination. Factors affecting viability; physiology of germination. Prerequisite: 205. Winter. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

455. **Botany of Weeds and Poisonous Plants.** Classification and biology of weeds; toxicology of plants; medicinal plants. Prerequisite: 206. Winter. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

456. **Poisonous Plants.** Classification, distribution, identification, and control of poisonous plants; toxicology of plants. Prerequisite: 101 or 102. Spring. Group conferences 3, 2 hr. Credit 3.

494. **Methods in Teaching Botany.** (Voc. Ed. 494.) Prerequisite: 15 credits of botany. Spring. Rec. 3. Credit 3.

505. **Methods in Cytology.** The paraffin method as applied to cytological material. The smear method, temporary and permanent. Living cells. Prerequisite: 406. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

546. **Seed Borne Diseases.** (F. C. 546.) Detection, identification, and control of parasitic organisms carried by crop seeds. Prerequisite: 207. Spring. Rec. 1. Lab. and rec. 2, 2 hr. Credit 3.

554. **Morphology of Crop Plants.** Structure and structural development of the more important crop plants as related to their cultivation. Prerequisite: 205. Spring. Group conference 2, 3 hr. Credit 3.

555. **Methods in Histology.** Methods of killing, imbedding, sectioning, and staining plant material. Prerequisite: 205. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3.

556, 557. **Advanced Histology.** (556) Origin, development, and structure of reproductive organs, seeds, and fruit of seed plants. Prerequisite: 405, 555. (557) Comparative histology of the wood of vascular cryptogams and seed plants. Prerequisite: 405. Spring. Group conference 2, 3 hr. Credit 3.

559. **Advanced Morphology.** One or more groups of the plant kingdom. Prerequisite: 406, 555. Fall, Winter, Spring. Rec. and lab. Credit 2 to 5.

564. **Physiology of Seeds and Special Problems.** Factors involved in the storage and germination of seeds. Prerequisite: 205. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

565. **Advanced Field Botany.** Plant life in the field, biologic and humanistic aspects. Selection of materials and methods of field presentation. Prerequisite: 205. Summer. Confer. 2, 1 hr. 12 hours field work. Credit 3.

566. **Native Range Plants.** Geographic distribution, identification and use of native field and forest forage plants. Fall. Prerequisite: 424. Rec. 1. Lab. 2, 3 hr. Credit 3.

571, 572, 573. **Advanced Plant Pathology.** Diseases of special crops. Virus, bacterial, and fungous diseases of field and horticultural crops. Prerequisite: 207 Fall, Winter, Spring, respectively. Rec. 2. Lab. 1, 3 hr. Credit 3 each course.

574. **Plant Pathology.** Specific problems in the diseases of plants. Prerequisite: 207. Fall, Winter, Spring.

575. **Field Mycology.** Collection and taxonomy of fungi, and relation of their occurrence to environmental factors. Preparation and utilization of mycological exsiccati. Prerequisite: 207. Rec. 2. Lab. 4, 3 hr. Credit 3. Summer.

576. **Field Plant Pathology.** Technique and interpretation of field plots, methods of preparation and application of fungicides; surveys and estimates of crop losses. Prerequisite: 207. Rec. 4. Lab. 4, 3 hr. Credit 4. Summer.

584. **Advanced Plant Ecology.** Origin, development and reactions of vegetation, classification of vegetation units, plant indicators. Prerequisite: 424. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

585. **Experimental Field Ecology.** Quantitative investigation of environment; methods and instruments used. Problems. Prerequisite: 424. Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

594. **Advanced Systematic Botany.** Special groups: (1) Algae, (2) mosses, (3) ferns, (4) seed plants. Prerequisite: 206. Fall, Winter, Spring. Rec. 1 or 2. Lab. 2 or 3, 3 hr. Credit 3 to 5.

595. **Agrostology.** Systematic position and economic uses of important grasses. Prerequisite: 205. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3.

596, 597. **Advanced Economic Botany.** Phylogeny, taxonomy, geography and agricultural uses of plants. Prerequisite: 205. Fall, Spring, respectively. Rec. 2. Lab. 2, 3 hr. Credit 4 each course.

598. **Seminars.** Meetings of the botanical staff and students to discuss recent literature, problems being investigated, and other topics of botanical interest.

A. For the staff and all students in botany. Fall, Winter, Spring.
B. For all students taking major work in plant pathology. Fall, Winter, Spring. Credit 1.
C. For all students taking major work in physiology and ecology. Fall, Winter, Spring. Credit 1.
D. For all students taking major work in morphology and taxonomy. Fall, Winter, Spring. Credit 1.

599. **History of Botany.** Prerequisite: 205. Spring. Lect. 3. Credit 3.

605. **Cytogenetics.** (Gen. 605.) Chromosome association and segregation, and the bearing of chromosome behavior on inheritance and evolution. Prerequisite: 406 and Gen. 300. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

606. **Morphology of the Algae.** Structure, reproduction, and systematic position of the algae. Prerequisite: 205. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3. Miss Hayden.

611, 612. **Plant Physiology.** The water relations of plants, mineral and organic nutrition, and physiology of growth. Prerequisite: 205. Chem. 256. Fall, Winter, respectively. Rec. 3. Lab. 1 or 2, 3 hr. Credit 4 or 5 each course. Mr. Loomis.

613. **Advanced Plant Physiology.** Growth correlations, tropisms and physiology of reproduction. Prerequisite: 612. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Loomis.

617. **Physiological Methods and Technique.** Winter. Rec. 1. Lab. 2 to 4, 3 hr. Credit 3 to 5. Mr. Bakke, Mr. Loomis.

618. **Plant Enzymes.** Role of enzymes in plants, their secretion, preparation, isolation, and specific action. Summer. Conference 2. Credit 1. Mr. Loomis.

634. **Bacterial and Virus Diseases of Plants.** Symptoms, environmental influences, host reactions, laboratory and greenhouse cultural studies. Prerequisite: 207. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Melhus.

635. **Disease Control.** Exclusion, eradication, protection, and methods of selection for disease resistance. Preparation of fungicides and theories of fungicidal action. Prerequisite: 573. Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Melhus, Mr. Dietz.

636. **Plant Pathological Technique.** Cultural, physiological and histological technique. Laboratory practice in isolation of parasites, germination, inoculation, and carrying stock cultures. Prerequisite: 207. Winter. Rec. 2. Lab. 3, 3 hr. Credit 5, Mr. Melhus, Mr. Gilman.

641, 642, 643. **General Mycology.** Taxonomy, morphology, and phylogeny of slime molds and fungi (phycomycetes, ascomycetes, fungi imperfecti, and basidiomycetes). Prerequisite: 207. Fall, Winter, Spring, respectively. Rec. 2. Lab. 2, 3 hr. Credit 4 each course. Mr. Gilman.

644. **Advanced Mycology.** Some specific group of the fungi as related to applied agriculture, pathology, bacteriology, soils, or dairying. Prerequisite: 643. Fall, Winter, Spring. Credit 3 to 5. Mr. Gilman.

654. **Advanced Plant Ecology.** Relation of environmental conditions to growth and competition in plants. Prerequisite: 584. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3. Mr. Aikman.

695. **Research.**
A. Morphology. Mr. Martin, Mr. Sass.
B. Physiology. Mr. Bakke, Mr. Loomis.
C. Plant Pathology. Messrs. Melhus, Dietz, Porter, Gilman, Reddy.
D. Mycology. Mr. Gilman.
E. Systematic Botany. Miss Hayden.
F. Plant Ecology. Mr. Aikman, Miss Hayden
G. Economic Botany. Mr. Dietz, Mr. Porter.

CERAMIC ENGINEERING

PAUL E. COX, Head of Department

Associate Professor Moulton; Instructor Petersen

For information concerning the Division of Engineering, see page 63.

The potter and his wheel were the beginning of ceramic engineering. The worker in glass and in enamelled metals, the Romans with their volcanic cements, and the primitive metallurgists with their needs for fire bricks, all laid foundations for the present day interests in the engineering incident to the manufacture of such products.

Ceramic enginering curricula, dealing with the application of chemistry, physics, mathematics, and the mathematical sciences to the solution of the problems of manufacture of brick, tile, terra cotta, pottery, glass, enamelled metal goods, cement, electrical insulators, spark plug porcelains, grinding wheels, fire resisting furnace parts, and countless other articles essential to civilization, are strictly American in origin and

are so recent that the first graduate from such a curriculum is still actively engaged in the pursuit of his profession. Foreign countries have patterned schools after those in America.

Iowa State College is one of the pioneer institutions to offer a curriculum so that special work in the silicate industries could be enjoyed. The curriculum gives adequate preparation in the sciences so that new problems can be met and solved, and sufficient contact with industrial processes so that a choice of the final field may be made wisely, according to the talents of the individual. The work appeals to any sort of temperament, there being demand for research works, business executives, sales force men, analysts, glaze and body experts, kiln designers, and in fact, every sort of talent.

Salaries are good and promotions are rapid for the capable.

Continual effort is made to foster Iowa industries and to make use of the abundant supplies of certain valuable raw materials. Citizens are invited to make use of the very complete facilities for tests and of the opinions afforded by the staff.

Curriculum in Ceramic Engineering

Leading to the degree of Bachelor of Science.

For graduate work, see page 89.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Proj. Drawing Engr. Dr. 132	3	Working Drawings Engr. Dr. 133	3
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1		
Military 121	1	Military 122	1	Military 123	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter).

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	4
Processing Raw Materials Cer.E. 216	3	Fabrication ,Cer. Wares Cer.E. 204	2	Engineering Problems Gen.E. 206	1
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Military 221	1	Expository Writing Engl. 204	2	Statics of Engineering T.&A.M. 274	3
		Military 222	1	Military 223	1
	17		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, Cer.E. 201, 202, 203.

JUNIOR YEAR

Principles of Economics Ec. 261	3	Ceramic Calculation Cer.E. 305	5	Refractories Cer.E. 306	3
Geology Geol. 201 or Physical Chemistry Chem. 321	4	Geology Geol. 202 or Physical Chemistry Chem. 322	4	Geology Geol. 203 or Physical Chemistry Chem. 323	4
Routine Test Methods Cer.E. 307	2	Dynamics of Engr. T.&A.M. 344 or Materials Lab. T.&A.M. 327	4	Extempore Speaking P.S. 311	2
Mechanics of Materials T.&A.M. 324	5	Prop. of Materials T.&A.M. 334		El. of Structures C.E. 335	5
*Electives	4	Electives	4	Electives	4
	18		17		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Cer.E. 301, 302, 303.

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

SENIOR YEAR

Kilns and Dryers Cer.E. 414	5	Plant Design Cer.E. 415	4	Special Problems Cer.E. 426	5
Concrete Structures C.E. 437	4	Engineering Valuation Engr. 407	3	Engineering Contracts Engr. 405	3
D.C. Cir. and Mach. E.E. 435		Physical Optics Phys. 516 or		Physical Chemistry Cer.E. 427	4
D.C. Laboratory E.E. 436 or	4	A.C. Cir. and Mach. E.E. 437	4	Pyrometry Cer.E. 416	3
Geometrical Optics Phys. 514		A.C. Laboratory E.E. 438		Electives	3
*Electives	5	Mineralogy Geol. 355	4		
		Electives	3		
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Cer.E. 401, 402, 403.

Curriculum in Ornamented Ceramics

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 36.

Public demand for better design and better taste in the coloring and decoration of ceramic wares has developed a need for persons who combine a thorough knowledge of the chemistry and physics of the raw materials used in the manufacture of ceramic products and of the processes of manufacture, with facility in drawing and design, and a cultural appreciation of the developments in fields of the fine arts which may be made applicable to ceramic decoration by mechanical means. Fine Arts schools can not include the sciences, and the usual engineering curricula do not include the necessary drawing and design work.

In the main the directors of the work of mechanical decoration of ceramic wares must be secured from abroad. Genius is not required, but ingenuity and resourcefulness in mechanical methods, coupled with good taste in choice of decorations and a liking for beauty in manufactured articles are essential. Persons with a knack at freehand drawing and interest in factory operations should find this curriculum both interesting and profitable. It does not provide training of a type that will lead to a career in the field of ceramic engineering.

The curriculum is of such nature that the graduate may expect to find

a place in the pottery, glass and enamelled metal industries, and on equal terms with the engineer. His particular fields would be in the technical processes employed in decorated glass, porcelain, white tableware, and terra cotta factories; in the manufacture of pottery, decorative supplies, and art potteries; and in the sales organizations of industries that furnish building materials to architects and builders.

This curriculum is peculiarly adapted to the training of men and women for the handling of retail businesses which sell pottery, glass, lamps, and floor and wall tiles. Likewise, graduates will be well equipped with the technical background now required of buyers for large wholesale and retail firms.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Project. Draw. Engr. Dr. 132	3	Working Drawings Engr. Dr. 133	3
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1	Military 123	1
Military 121	1	Military 122	1		
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter).

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Freehand Drawing Arch.E. 114	3	Expository Writing Engl. 204	2	Decoration Technique Cer.E. 215	4
Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	4
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	
Military 221	1	Motifs Cer.E. 214	2	Military 223	
		Military 222	1		
	17		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, Cer.E. 201, 202, 203.

JUNIOR YEAR

Organic Chemistry Chem. 331 or Freehand Drawing Arch.E. 231	4 or 3	Organic Chemistry Chem. 332 or Freehand Drawing Arch.E. 232	4 or 3	Organic Chemistry Chem. 333 or Freehand Drawing Arch.E. 233	4 or 3
Ceramic Calculations Cer.E. 305	5	Commercial Pottery Cer.E. 317	2	Decoration Media Cer.E. 318	4
Block Molds Cer.E. 314	4	Decalcomania Production Cer.E. 315	4	Decalcomania Production Cer.E. 316	4
*Electives	4	Mineralogy Geol. 355	4	Extempore Speaking P.S. 311	2
		Electives	4	Electives	4
	16 or 17		17 or 18		17 or 18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Cer.E. 301, 302, 303.

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

SENIOR YEAR

Kilns and Dryers Cer.E. 414	5	Production Problems Cer.E. 428	5	Physical Chemistry Cer.E. 427	4
Qualitative & Quantitative Organic Anal. Chem. 581 or Freehand Drawing Arch.E. 326	3	Engineering Valuation Engr. 407	3	Engineering Contracts Engr. 405	3
		Modern Language or Adv. Quant. Analysis Chem. 512	4	Production Problems Cer.E. 429	4
Modern Language or Adv. Quant. Analysis Chem. 511	4	Electives	6	Modern Language or Adv. Quant. Analysis Chem. 513	4
*Electives	6			Electives	3
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Cer.E. 401, 402, 403.

Description of Courses

201, 202, 203. **Seminar.** A weekly meeting for the transaction of campus and off-campus student business. Fall, Winter, Spring, respectively. Required each course.

204. **Fabrication of Ceramic Wares.** Potter's wheel; plaster of Paris molds; jiggering, pressing and casting wares; glaze dipping; placing and firing small wares. Winter. Lab. 2, 3 hr. Credit 2.

214. **Motifs.** Freehand drawing from plant and other life as the basis of motifs for designs to be used in the ornamentation of ceramic products. Prerequisite: Arch. E. 115 or equivalent. Winter. Lab. 2, 3 hr. Credit 2.

215. **Decoration Technique.** Lining and gilding. Copper and steel plate engraving. Fill in. Ground laying. Prerequisite: 214 or equivalent. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

216. **Processing Raw Materials.** Processes of winning raw materials; preparation, handling, and storing materials; discussion of tests of materials and products; machines and plant layouts for ceramics products production. Fall. Rec. 3. Credit 3.

301, 302, 303. **Seminar.** Weekly meeting. Fall, Winter, Spring, respectively. Required each course.

305. **Ceramic Calculations.** Compounding bodies, glazes, glass and enamels. Prerequisite: Chem. 213. Fall, Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

306. **Refractories.** Nature and source of raw materials. Tests for raw materials and finished products. Consumers' requirements for finished products. Prerequisite: 305. Spring. Rec. 3. Credit 3.

307. **Routine Test Methods.** American Ceramic Society standard tests of raw materials and finished products. Fall. Lab. 2, 3 hr. Credit 2.

314. **Block Molds.** Design of dinner service and other pottery shapes, production of block mold; embossing. Prerequisite: 204, 214. Fall. Rec. 2. Lab 2, 3 hr. Credit 4.

315. **Decalcomania Production.** Lithography and similar processes, properties of the papers employed, plant requirements. Prerequisite: 314. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

316. **Decalcomania Production.** Continuation of 315, and including practice in the production of finished decalcomania. Prerequisite: 315. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

317. **Commercial Pottery.** Faience, red wares, yellow wares, jets, earthenware, soft and hard porcelain, hotel china, bone china, floor and wall tiles. Glazes and bodies suitable for such wares. Prerequisite: 305. Winter. Rec. 2. Credit 2.

318. **Decoration Media.** Ceramic colors, golds, lustres, crystalline glazes, slip paints, art enamels. Prerequisite: 305. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

324. **Hand Made Pottery.** Avocational pottery making, coiling and modeling of forms and design and execution of simple decorations. Dipping of glazes. Simple mold making. For public school teachers, occupational therapy workers, and persons who crave to do creative work. Freehand drawing is a desirable antecedent but is not required. Fall, Winter, Spring. Lab. 1 to 5, 3 hr. Credit 1 to 5.

401, 402, 403. **Seminar.** Fall, Winter, Spring, respectively. Weekly meeting to transact student business. Required each course.

414. **Kilns and Dryers.** Types of kilns, furnaces and dryers used in the manufacture of clay products, glass and enamels. Heat balance calculations, control devices, chemistry of kiln, and dryer operation, applied pyrometry and thermometry. Prerequisite: 306. Fall. Rec. 5. Credit 5.

415. **Plant Design.** Preparation of plans and specifications for a ceramic plant suitable for a branch of the industry selected by the student. Prerequisite: 414, C.E. 437. Winter. Rec. 1. Lab. 3, 3 hr. Credit 4.

416. **Pyrometry.** Theory and practice of high temperature measuring devices, including electrical, optical, and pyro-chemical types. Prerequisite: Math. 212, Phys. 223. Spring. Rec. 3. Credit 3.

421, 422, 423. **Ceramic Arts and Crafts.** Avocational work in china and glass painting, leaded glass work, art enamels, clay modeling and pottery making. For Industrial Arts teachers, occupational therapy workers, home makers, and those interested in avocational pursuits that can be carried on with limited equipment in the home. (Student must supply himself with brushes, colors, and all other supplies except clay.) Prerequisite: 214, or equivalent. Fall, Winter, Spring, respectively. Lab. 1 to 5, 3 hr. Credit 1 to 5 each course.

424. **Decorated and Decorative Structural Materials.** Made from clays. Exercises in modeling and decorating terra cotta, garden pottery, faience tiles, etc. Fall, Winter, Spring. Lab. 3, 3 hr. Credit 3.

425, 426. **Special Problems.** A problem is selected in conference with the instructor, carried through to completion under direction and finally written up in a form suitable for publication. Prerequisite: Chem. 323, and senior classification in Cer. Engr. Winter, Spring. Credit 4 to 7.

427. **Physical Chemistry.** (Chem. 427.) Applied to processes in ceramic manufacture. Prerequisite. Chem. 323. Spring. Rec. 4. Credit 4.

428, 429. **Production Problem.** The production of one type of ceramic product is carried from the material bin to commercial perfection. Student must select some type of product that involves use of a decorative process. A full written report is required. Prerequisite: 316, 318. Winter. Lab. 5 or 4, 3 hr., respectively. Credit 5 or 4.

601, 602, 603. **Ceramic Technology.** Research problems with ceramic materials. Fall, Winter, Spring, respectively. Rec. and lab. 5. Credit 5 each course.. Mr Cox, Mr. Moulton.

608. **Research.** Mr. Cox, Mr. Moulton.

CHEMICAL AND MINING ENGINEERING

O. R. SWEENEY, Head of Department

Associate Professor Webber; Assistant Professor McMillen; Instructor Hoppe; Graduate Assistants Benson, Bridger

For information concerning the Division of Engineering, see page 63.

The department of Chemical and Mining Engineering was established to supply men for those industries which require engineers with a thor-

ough knowledge of chemistry. The department gives degrees in chemical and in mining engineering.

Besides the work given in the department, the student studies theoretical and applied chemistry, physics, mechanical drawing, mathematics, theoretical and applied mechanics, electrical engineering, and English.

At no period in the world's history has there been such a consistent demand for chemically trained engineers. Because of the unprecedented demand for the production of every sort of material in the cheapest possible manner, it is only natural that the winning of the primary materials from the earth should demand a large number of trained engineers. Likewise, since these raw materials are being elaborated into such a large variety of materials by means of chemical processes, there is a large and constantly increasing demand for men trained in the fundamental operations of chemical engineering.

To list only a few of the demands for these men, there is cited the manufacture of heavy chemicals, dyes, sugar and foods in general, soap, electro-chemical products, paints, varnishes, lacquers, gas, tar, coke, and coal tar products. In the mining field such materials as coal, clay, gypsum, and metal ores demand their quota of trained engineers.

Two units of a building devoted exclusively to the departmental work have been completed. The departmental equipment consists of crushers, grinders, tube and pebble mills, jigs, classifiers, ore dressing machines, thickeners, Wilfley tables, vanners, hydraulic presses, extractors, filter presses, furnaces, centrifugal machinery, and water softeners; a large assortment of vacuum, atmospheric and pressure machinery, such as digestors, evaporators, distillation equipment, driers, and reaction vessels; also an electro-chemical laboratory supplied with direct and alternating current, with a very complete assortment of electro-chemical machinery; and control laboratories, fitted with the necessary testing and control apparatus.

Curriculum in Chemical and Mining Engineering

Leading to the degree of Bachelor of Science.
For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Proj. Drawing Engr. Dr. 132	3	Working Drawings Engr. Dr. 133	3
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1	Pipe Fitting M.E. 231	1
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., Chem.E. 100 (Spring).

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	3
Inorganic Chemistry Chem. 201	2	Inorganic Chemistry Chem. 202	2	El. of Chemical Engr. Chem.E. 216	2
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Expository Writing Engl. 204	2	Extempore Speaking P.S. 311	2	Engineering Problems Gen.E. 206	1
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Light and Sound Phys. 223	5
Military 201 or 221	1	Military 202 or 222	1	Machine Work M.E. 232	2
				Military 203 or 223	1
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

Summer Plant or Mine Practice, 170 hours.

CHEMICAL ENGINEERING

JUNIOR YEAR*

Physical Chemistry Chem. 321	4	Physical Chemistry Chem. 322	4	Physical Chemistry Chem. 323	4
Organic Chemistry Chem. 331	5	Organic Chemistry Chem. 332	5	Organic Chemistry Chem. 333	5
Statics of Engineering T.&A.M. 274	3	Mechanics of Materials T.&A.M. 324	5	Dynamics of Engineering T.&A.M. 344	4
†Principles Chem.E. 351	2	†Principles Chem.E. 352	3	†Principles Chem.E. 353	3
Chemical Tech. Chem. 314	4	Power Measurement Lab. M.E. 354	1	Materials Laboratory T.&A.M. 327	2
	18		18		18

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

†For students appointed to the Reserve Officers' Training Corps (see page 244), this course may be omitted in the Junior year; substitution will be allowed in such manner that the course may be taken in the Senior year.

SENIOR YEAR‡

Industrial Chemistry Chem.E. 411	3	Industrial Chemistry Chem.E. 412	3	Industrial Chemistry Chem.E. 413	3
Chemical Engr. Lab. Chem.E. 421	3	Chemical Engr. Lab. Chem.E. 422	3	Chemical Engr. Lab. Chem.E. 423	3
Engineering Valuation Engr. 407	3	A.C. Machines E.E. 437	3	Engineering Contracts Engr. 405	3
D.C. Machines E.E. 435	3	A.C. Laboratory E.E. 438	1	Chemical Engr. Design Chem.E. 473	2
D.C. Laboratory E.E. 436	1	Chemical Engr. Design Chem.E. 472	2	Special Problems Chem.E. 466	2
Chemical Engr. Design Chem.E. 471	2	Special Problems Chem.E. 465	3		
*Electives	3	Electives	3	Electives	4
	18		18		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Chem.E. 401, 402, 403.

MINING ENGINEERING

For Freshman and Sophomore years, see page 143.

JUNIOR YEAR

Principles Mn.E. 351	2	Principles Mn.E. 352	3	Principles Mn.E. 353	3
General Geology Geol. 201	4	General Geology Geol. 202	4	General Geology Geol. 203	4
Surveying C.E. 325	3	Mineralogy Geol. 355	4	Mine Surveying C.E. 330	3
Statics of Engineering T.&A.M. 274	3	Mechanics of Materials T.&A.M. 324	5	Dynamics of Engr. T.&A.M. 344	4
Chemical Technology Chem. 314	4	Engineering Contracts Engr. 405	3	Materials Laboratory T.&A.M. 327	2
*Electives	2			Electives	2
	18		19		18

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

SENIOR YEAR‡

D.C. Machines E.E. 435	3	A.C. Machines E.E. 437	3	Mining Engr. Design Mn.E. 473	2
D.C. Laboratory E.E. 436	1	A.C. Laboratory E.E. 438	1	Mn. Engr. Laboratory Mn.E. 423	3
Mining Engr. Design Mn.E. 471	2	Mining Engr. Design Mn.E. 472	2	Mining Enterprises Mn.E. 416	2
Mn. Engr. Laboratory Mn.E. 421	3	Mn. Engr. Laboratory Mn.E. 422	3	Engineering Valuation Engr. 407	3
Economic Geology Geol. 434	4	Economic Geology Geol. 455	4	Special Problems Mn.E. 465, 466, or Electives	3
Structural Geology Geol. 354	4	Treatment of Ores Mn.E. 415	2		
		Assaying Mn.E. 417	2		
		Special Problems Mn.E. 465 or Electives	2		
				Electives	3
	17		19		16

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Mn.E. 401, 402, 403.

‡Each student is expected to make an inspection trip during the Senior year, in charge of an engineering instructor.

Suggested Electives: Bacteriology; Ceramics; Chemistry; Chemical Engineering 466, 586; Civil Engineering; Economics; English; General Engineering; Geology; Government 315; Hydraulics; Mechanics; Mechanical Engineering; Mineralogy; Modern Language.

Description of Courses

CHEMICAL ENGINEERING GROUP

100. **Technical Lecture.** The fields of chemical and mining engineering; the relation of the chemical engineer to industry. Spring. Lect. 1. Required.

161, 162, 163. **Chemical Engineering Laboratorian.** An approved assignment as laboratorian on special problems. Open only to students permanently excused from military training. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.

216. **Elements of Chemical Engineering.** Introduction to chemical engineering. Typical processes. Problems. Spring. Lect. 2. Credit 2.

351, 352, 353. **Principles of Chemical Engineering.** (351) Industrial stoichiometry. Prerequisite: Chem. 213. Fall. Lect. 2. Credit 2. (352, 353) Raw materials; fundamental operations. Prerequisite: 351. Winter, Spring, respectively. Lect. 3. Credit 3 each course.

401, 402, 403. **Technical Seminar.** Technical reports. Fall, Winter, Spring, respectively. Lect. 1. Required each course.

411, 412, 413. **Industrial Chemistry.** Chemical engineering and chemical engineering machinery. Discussion of chemical processes, raw materials and their elaboration. Industrial chemical and electro-chemical operations. Prerequisite: 353. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course.

421, 422, 423. **Chemical Engineering Laboratory.** Elaboration of raw materials and the use of chemical machinery. Calculation of costs and efficiencies. Control of operations. Physical and physico-chemical methods of plant control. To parallel 411, 412, 413. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

441, 442, 443. **Elements of Chemical Engineering.** For chemical technology, industrial science, and graduate students. Industrial stoichiometry, raw materials. fundamental chemical engineering operations, chemical engineering equipment, and chemical industrial processes. Prerequisite: Chem. 333. Fall, Winter, Spring, respectively. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3 each course.

465. **Special Problems.** On an approved topic to be selected before the end of the fall quarter of the senior year. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

466. **Special Problems.** Continuation of 465. Fall, Winter, Spring. Lab. 2 to 9, 3 hr. Credit 2 to 9.

471, 472, 473. **Chemical Engineering Design.** Design and layout of chemical plants and chemical machinery. Prerequisite: 353. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

586. **Advanced Applied Electro-Chemistry.** Electro-chemical industries. Prerequisite: 411. Spring. Lect. 3. Credit 3.

600 **Chemical Engineering Research.** Messrs. Sweeney, Webber, McMillen.

610. **Chemical Engineering Investigations.** Prerequisite: 413. Alternate years Offered Fall, Winter, Spring, 1936-'37. Lect. and conf. 3. Credit 3. Messrs. Sweeney, Webber, McMillen.

614. **Advanced Industrial Chemistry.** Special advanced topical studies on chemical manufactories, such as foods, fertilizers, rayon, fixation of nitrogen, utilization of by-products, etc. Prerequisite: 413 or 443. Alternate years. Offered Fall, 1937. Lect. 3. Credit 3. Mr. Sweeney.

615. **Organization of Chemical Engineering Industries.** The development of the chemical engineering industry based upon the fundamental principles of plant location, design, unit operation costs, power utilization, management, and operation Prerequisite: 353. Alternate years. Offered Spring, 1938. Lect. 3. Credit 3. Mr. Sweeney.

616. **Cellulose Industries.** The cellulosic raw materials, their chemistry, physics, economics and industrial uses. Prerequisite: 443 or 413. Alternate years. Offered Winter, 1938. Lect. 3. Credit 3. Mr. Webber.

620. **Advanced Technical Seminar.** Weekly conference. Discussion of current topics. Presentation of original papers. Prerequisite: graduate major in chemical engineering. Fall, Winter, Spring. One hour per week required without credit. Mr. Sweeney.

621, 622, 623. **Advanced Chemical Engineering Laboratory.** Advanced studies in unit operations. Prerequisite: 423. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course. Mr. Webber, Mr. McMillen.

651, 652, 653. **Advanced Chemical Engineering.** Selected advanced studies on chemical engineering unit operations. Prerequisite: 353. Alternate years. Offered Fall, Winter, Spring, 1936-1937. Lect. 3. Credit 3 each course. Messrs. Sweeney, Webber, McMillen.

671, 672, 673. **Advanced Chemical Engineering Design.** Design and layout of chemical plants and machinery. Planning industrial chemical laboratories. Prerequisite: 473. Fall, Winter, Spring, respectively. Lab. 1 to 3, 3 hr. Credit 1 to 3 each course. Mr. Sweeney.

MINING ENGINEERING GROUP

351, 352, 353. **Principles of Mining Engineering.** (351) Selected studies on excavating, boring, shaft sinking, and mining. Prerequisite: Chem. 213. Fall. Lect 2. Credit 2. (352, 353) Selected studies on mining apparatus, stoping, hoisting, ventilation, transportation, etc. Prerequisite: 351. Winter, Spring respectively. Lect. 3. Credit 3 each course.

401, 402, 403. **Technical Seminar.** Technical reports. Fall, Winter, Spring, respectively. Lect. 1. Required each course.

415. **Treatment of Ores.** Ore dressing and amalgamation. Prerequisite: 351. Winter. Rec. 1. Lab. 1, 3 hr. Credit 2.

416. **Mining Enterprises.** Prospecting. Developing mineral deposits. Prerequisite: 415. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

417. **Assaying.** Fire assay methods for determination of gold, silver, and lead values in ores. Prerequisite: 351. Winter. Rec. 1. Lab. 1, 3 hr. Credit 2.

421, 422, 423. **Mining Engineering Laboratory.** Elaboration of raw materials and the use of mining machinery. Calculation of costs and efficiencies. Control of operations. Physical and physical chemical methods of mining plant control. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

424. **Mine Surveying.** Reviewing and advanced method. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

465, 466. **Special Problems.** On an approved mining engineering topic. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

471, 472, 473. **Mining Engineering Design.** Mine plant design and selection of mine plant equipment. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

561, 562, 563. **Metallurgy.** The winning of iron, steel, copper, gold, silver, lead, zinc, etc. Prerequisite: Chem. 333. Fall, Winter, Spring, respectively. Lect 2. Lab. 1, 3 hr. Credit 3 each course.

600. **Mining Engineering Research.** Messrs. Sweeney, Webber, McMillen.

CHEMISTRY

W. F. Coover, Head of Department

Professors Brown, Buchanan, Fulmer, Gilman, Hixon, Nelson, Wilkinson; Associate Professors Clark, Edgar, Jennings, Naylor; Assistant Professors Bird, Borgeson, Johns, King; Instructors Bickford, Castonguay, Greer, Ireland, Kempf, Lykken, McIntosh, Martin, Menzel, Moore, Sieling, Underkofler, Wilhelm; Graduate Assistants Barnett, Barr, Bindschadler, Brown, Buchanan, Cohee, Dawson, Dundon, Eaton, Franz, Greenwood, Griffith, Hunter, Jones, Kelley, McPherson, Naps, Perkins, Rayman, Rieke, Roehm, Ruby, Seiferle, Stewart, Sutton, Swislowsky, VanEss, Whistler, Williams, Young; Teaching Scholar Schoene.

For information concerning the Division of Industrial Science, see page 69.

The Department of Chemistry occupies a building which is one of the largest of its kind, having a floor space of one hundred and thirty thousand square feet. It is modern in its arrangement and building equipment. In addition to the large laboratories it contains many special and research laboratories, in which a number of research students are accommodated.

The department is organized to meet the demands for chemical training in a highly technical institution. Its work is therefore comprehensive and is grouped under the following heads: Inorganic chemistry and qualitative analysis, analytical, bio-physical, enzyme, food and sanitary, organic, physical, plant, physiological and nutritional, soil, and textile chemistry.

The equipment for carrying out the above lines of work is good. It is being increased as the developments in chemistry demand it.

The following curricula are offered:

a. Chemical Technology.
b. Industrial Science with major in Chemistry.
c. Graduate courses leading to the M.S. and Ph.D. degrees.

Chemical Technology

The field of chemical technology, which involves teaching, government, and research work, as well as industrial work, is becoming increasingly important as industry expands and is placed more completely

under scientific control. It is a recognized fact that the economic utilization of our resources is a necessity. The trend in industrial development is toward diversification, quality, and economy in production. These are factors which are making obsolete many of the processes of industry and rendering imperative the employment of scientifically trained men.

This curriculum gives the basic training desired for positions as consulting chemists; as superintendents of factories of the industries based on chemistry or under chemical control, such as the manufacture of glass, pigments, paints and varnishes, oils and fats, soaps, sugar, glucose, explosives, dyes, gas, iron and steel alloys, petroleum products, paper, leather, fine chemicals, perfumes, drugs, foods; as chemists in government, state, municipal, experiment station, research or factory laboratories; or as teachers of chemistry.

Curriculum in Chemical Technology

Leading to the degree of Bachelor of Science.
For entrance requirements, see page 36.

FRESHMAN YEAR

For freshman year, see curriculum in Industrial Science, page 226. which is to be followed, except that Chem. 101C, 102C, and 103C shall be taken.

Students taking the curriculum in Chemical Technology should elect Zool. 104, 105, and Bot. 101 in their freshman year.

SOPHOMORE YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Advanced Inorganic Chem. 201[1]	2	Advanced Inorganic Chem. 202	2	Qualitative Analysis Chem. 203	3
Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	3
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Military 221	1	Military 222	1	Military 223	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

JUNIOR YEAR

Physical Chemistry Chem. 321	4	Physical Chemistry Chem. 322	4	Physical Chemistry Chem. 323	4
Organic Chemistry Chem. 331	5	Organic Chemistry Chem. 332	5	Organic Chemistry Chem. 333	5
Reasoning and Writing Engl. 205	3	Drawing and Projection Engr. Dr. 131	2	American Government Govt. 315	3
*Electives	3	*Electives	5	Working Drawings Engr. Dr.133	2
				*Electives	3
	15		16		

SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
**Chem. Technology Chem. 411	3	**Chem. Technology Chem. 412	3	**Micro. and Quant. Micro-Chem. Analysis Chem. 518	3
El. of Chemical Engr. Chem.E. 441	3	El. of Chemical Engr. Chem.E. 442	3	El. of Chemical Engr. Chem.E. 443	3
German M.L. 441	3	German M.L. 442	3	German M.L. 443	3
Principles of Economics Ec. 261	3	Accounting Ec. 374	3	Business Law Ec. 365 or Spec. and Contr. Engr. 405	3
Electives	4	Electives	4	Electives	4
	16		16		16

*Electives. It is urged that electives be chosen largely in courses other than Chemistry. For information concerning the Reserve Officers' Training Corps, see page 244.
**Elective courses approved by the Head of the Department and the Dean of the Division may be substituted for Chem. 411, 412, 518.

Curriculum in Industrial Science—Major Chemistry

This curriculum is offered in order to co-operate with other departments of the institution in preparing students for responsible positions in industries which require fundamental training in other sciences along with intensive training in chemistry. These fields are important. Notable examples are found in the demand for bacteriological chemists in the canning, preserving, and packing industries, and for chemists with special training in the baking, photographic, wholesale food, feed and dairy industries, and for water survey and board of health work. This curriculum is also important for training teachers for science work in high schools and colleges.

For freshman and sophomore years, see the general curriculum in Industrial Science, page 226.

For the junior and senior years the student must fulfill all the requirements as given on page 227.

Graduate Curricula and Degrees

Graduate work in chemistry is also offered leading to the degrees of Master of Science and Doctor of Philosophy. A full description of courses will be found in the Graduate Bulletin.

Description of Courses

Index to course numbers is given by the second and third figures:

(a) Inorganic Chemistry and Elementary Qualitative Analysis	01 to 09	(g) Household (including Textile) Chemistry	61 to 69
(b) Analytical Chemistry	11 to 19	(h) Physiological and Nutritional Chemistry	71 to 79
(c) Physical Chemistry	21 to 29	(i) Bio-physical (including Enzyme and Zymo-) Chemistry	81 to 89
(d) Organic Chemistry	31 to 39	(j) Research	91 to 99
(e) Food and Sanitary Chemistry	41 to 49		
(f) Agricultural (including Plant and Soil) Chemistry	51 to 59		

For description of courses, see page 290.

101. General Chemistry. Principles and the non-metallic elements.
A. For students who have not had high school chemistry. Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.

B. For students who have had high school chemistry. Fall. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
C. For students desiring a more extended study. Fall. Lect., demonstration, and rec. 2. Conference 1. Lab. 2, 3 hr. Credit 4.

102. **General Chemistry.** Metallic elements.
A. For students who have not had high school chemistry. Prerequisite: 101. Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
B. For students who have had high school chemistry. Prerequisite: 101. Winter. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.
C. For students desiring a more extended study. Prerequisite: 101. Winter. Lect., demonstration and rec. 2. Conference 1. Lab. 2, 3 hr. Credit 4.

103. **General Chemistry.** General principles and analytical relationships including separation of common ions. Prerequisite: 102 or 106. Fall, Spring. Lect. and demonstration 1. Rec. and conference 2. Lab. 2, 3 hr. Credit 4.
C. For students desiring a more extended study. Spring. Lect., demonstration and rec. 2. Conference 1. Lab. 2, 3 hr. Credit 4.

105, 106. **General Chemistry.** For Home Economics students. Principles and the non-metallic elements. (105) Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4. (106) Metallic elements and their compounds. Fall, Winter, Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4. (A) For those who have not had high school chemistry. (B) For those who have had high school chemistry.

107. **Applied Chemistry.** For Agricultural Engineering and Civil Engineering students. The chemistry of materials with some work in qualitative analysis. Prerequisite: 102. Spring. Lect. and demonstration 2. Rec. and conference 2. Lab. 1, 3 hr. Credit 4.

174. **Applied Organic Chemistry.** For Veterinary students. Attention given to organic compounds of biological importance. Prerequisite: 103 or equivalent in general chemistry. Fall. Lect. 2. Rec. 1. Lab. 2, 3 hr. Credit 5.

175. **Physiological Chemistry.** For Veterinary students. Chemistry of the animal body; digestion; metabolism; nutrition. Prerequisite: 174. Winter. Lect. 2. Rec. 1. Lab. 2, 3 hr. Credit 5.

201, 202. **Inorganic Chemistry.** Principles and theories in detail. Prerequisite: 103. (201) Fall, Winter. (202) Winter, Spring. Lect. 2. Credit 2 each quarter.

203. **Qualitative Analysis.** Systematic analysis for ions except those of rare elements, with special attention to theory and the detection of negative ions. Prerequisite: 103. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

211, 212, 213. **Quantitative Analysis.** Theory and practice of elementary gravimetric and volumetric analysis. Prerequisite: 103. Fall, Winter. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 or 5. Spring. Rec. 1. Lab. 2 or 3, 3 hr. Credit 3 or 4.

251, 252 **Applied Organic Chemistry.** For Dairy Industry students. Principles of organic and bio-chemistry with applications to the dairy industry. Prerequisite: 103. Fall, Winter. Lect. and demonstration 2. Lab. 1, 4 hr. Credit 3 each course.

253. **Quantitative Analysis.** For Dairy Industry students. Principles and methods of gravimetric and volumetric analysis applied to the dairy industry. Prerequisite: 252 or 256. Spring. Lect. and demonstration 2. Lab. 1, 4 hr. Credit 3.

255, 256. **Applied Organic Chemistry and Quantitative Analysis.** Fundamentals of the two fields with applications to agriculture. Prerequisite: 103. (255) Fall, Winter. (256) Winter, Spring. Lect. and demonstration 2. Lab. 1, 4 hr. Credit 3 each course.

257. **Applied Organic Chemistry.** For Forestry students. Organic chemistry with applications to the fields concerned. Prerequisite. 102. Spring. Lect. and demonstration 3. Lab. 2, 2 hr. Credit 4.

258. **Applied Organic Chemistry.** For Horticultural students. Continuation of 255 involving applied work specially adapted to the field concerned. Winter. Lect. 1. Lab. 1, 3 hr. Credit 2.

259. **Chemistry of Forest Products.** Plant metabolism and plant products. Spring. Prerequisite: 257. Lect. or rec. 2. Credit 2.

264. **Organic Chemistry.** For Home Economics students. The fundamental principles of organic chemistry. Prerequisite. 106. Fall, Winter, Spring. Lect 3. Lab. 2, 3 hr. Credit 5.

265. **Food Analysis.** For Home Economics students. Elementary gravimetric and volumetric analysis and the methods of food analysis. Prerequisite: 264. Fall, Winter, Spring. Lect. 3. Lab. 2, 3 hr. Credit 5.

266. **Food Analysis.** For Home Economic students. An elementary course devoted to methods of analysis. Prerequisite: 264. Fall, Winter, Spring. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

267. **Food Analysis.** For Home Economics students. Completes the work of course 265 omitted in course 266. Prerequisite: 266. Spring. Rec. and demonstration 1. Lab. 1, 3 hr. Credit 2.

268. **Textile Analysis.** For Home Economics students. Elementary gravimetric and volumetric analysis and the analysis of fibers and textiles by chemical and physical methods. Prerequisite: 264. Spring. Lect. and rec. 3. Lab. 2, 3 hr. Credit 5.

274. **Physiological and Nutritional Chemistry.** Fundamental principles of physiological chemistry and the chemistry of nutrition. Prerequisite: 266. Fall, Winter, Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

275. **Physiological and Nutritional Chemistry.** Chemical composition of living matter; metabolism; fundamentals of nutritional chemistry. Prerequisite: 253, 265, or 266. Fall, Winter, Spring. Lect. 3. Lab. 2, 3 hr. Credit 5.

314. **Chemical Technology.** Technical examination of cements, fuels, oils, gas, road materials, boiler waters, and the treatment of boiler water. Prerequisite: 213. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

321, 322, 323. **Physical Chemistry.** Properties of gases, liquids, and solids; solutions, thermo-chemistry, reaction velocity, electro-chemistry, equilibrium. Prerequisite: 213, Phys. 223, Math. 212, and Chem. 331 as parallel. Fall, Winter. Rec. 3. Lab. 1, 3 hr. Credit 4. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

331, 332, 333. **Organic Chemistry.** For Chemistry and Chemical Engineering students, and students specializing in pre-medical and applied biological sciences. Prerequisite: 103. Fall, Winter, Spring, respectively. Lect. 2. Rec. 1. Lab. 2, 3 hr. Credit 2 to 5 each course.

345 **Food Analysis.** Methods of analysis, detection of adulterations and interpretation of results. Prerequisite: 253, 265, or 266. Fall, Winter. Lect. 2. Lab. 0 to 3, 3 hr. Credit 2 to 5.

346. **Manufacture of Food Products.** Discussion of raw materials and chemical processes involved. Prerequisite: 253, 265, or 266. Alternate years. Offered Spring, 1937. Lect 3. Credit 3.

347. **Dairy Chemistry.** Analysis of pure and adulterated dairy products and detection of preservatives and coloring matters. Prerequisite: 253, 265, or 267. Fall. Rec. 2. Lab. 3, 3 hr. Credit 5.

348. **Advanced Dairy Chemistry.** Advanced analytical methods; detailed study of composition and changes of composition occurring in manufacture. Prerequisite. 347. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

411, 412. **Chemical Technology.** Gas analysis, calorimetry. Application of analytical methods and commercial tests to industrial materials, control of plants and purchase of supplies. Prerequisite: 213, 322, 333. Fall, Winter, respectively. Rec. 1. Lab. 2, 3 hr. Credit 3 each course.

427. **Physical Chemistry.** (Cer.E. 427.) Applied to processes in ceramic manufacture. Prerequisite: 323. Spring. Rec. 4. Credit 4.

431, 432, 433. **Organic Chemistry.** For chemistry students and those specializing in applied biological sciences. Principles of organic chemistry, including a brief introduction to qualitative organic analysis, and training in the use of chemical literature. Prerequisite: 103. Fall, Winter, Spring, respectively. Lect. 2. Conf. 1. Lab. 2, 3 hr. Credit 3 or 5 each course.

441, 442, 443. **Sanitary Chemistry.** Elements of quantitative analysis; analysis and purification of potable waters; sewage analysis; interpretation of results; planning and organization of sanitary survey work. Alternate years. Offered Fall, Winter, Spring, respectively, 1936-'37. Prerequisite: Qualitative Analysis. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 or 5 each course.

466. **Textile Chemistry.** For students specializing in Textiles. Quantitative, physical and chemical analysis of yarns and fabrics; scouring, bleaching, and finishing processes. Prerequisite: 268. Fall, Spring. Lect. 2. Lab. 2, 3 hr. Credit 4

474. **Physiological and Nutritional Chemistry.** Fundamentals of chemistry in life processes. Prerequisite: elementary organic and analytical chemistry. Fall, Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

495. **Teaching Chemistry.** (Voc. Ed. 495.) Methods of presentation and study of subject matter supported by class and laboratory demonstration. Prerequisite: 15 credits of chemistry including 211, or 331, or equivalent. Lect. and rec 2. Lab. 1, 3 hr. Credit 3.

501, 502, 503. **Inorganic Preparations.** Preparation of inorganic compounds. May be taken as laboratory to accompany 605, 606. Fall, Winter, Spring, respectively. Lab. 1 or more, 3 hr. Credit 1 or more each course.

511, 512, 513 **Advanced Quantitative Analysis.** Intensive study of analytical processes in the light of modern theories, including difficult separations, electrometric titrations, indicators, nephelometry, etc. Prerequisite: 213. Fall, Winter, Spring respectively. Lectures offered alternate years. Fall 1937. (511) Lect. 3. Lab. 0 to 3, 3 hr. Credit 3 to 6. (512, 513) Lab. 2 or more, 3 hr. Credit 2 or more.

514. **Spectrographic Analysis.** Application of spectrographic methods to the analysis of various substances for large and small amounts of many rare and common elements. Prerequisite: Quantitative analysis, and Phys. 213. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

515, 516. **Metallography.** Treats of iron, steel, and other alloys. Prerequisite: Quantitative Analysis. Alternate years. Offered Fall, Winter, respectively, 1936-'37. Rec. 2. Lab. 2 or 3, 3 hr. Credit 4 or 5 each course.

518. **Microscopic and Quantitative Micro-Chemical Analysis.** Training in the essential manipulative methods for the microscopic identification of elements and compounds, for micro preparations, and for micro-elementary analysis. Prerequisite: 203, 213, 333. Graduates, Winter. Undergraduates, Spring. Lect. and rec. 1. Lab. 2, 3 hr. Credit 3 each time taken.

521, 522, 523. **Advanced Physical Chemistry.** The more important phases of physical chemistry from the standpoint of thermodynamics. Prerequisite: 323. Lect. 2. Lab. 0 to 3, 3 hr. Credit 2 to 5 each course.

525, 526. **Colloids and Catalysis.** (525) A systematic survey of the properties of colloidal systems. (526) Special topics in colloid chemistry; catalysis in homogeneous and heterogeneous systems. Prerequisite: 213, 323. Fall, Spring, respectively. Lect. 2. Lab. 0 or 1, 3 hr. Credit 2 or 3 each course.

531. **Qualitative and Quantitative Organic Analysis.** Prerequisite: 213, 333. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

532, 533. **Intermediate Organic Chemistry.** Problems, abstracts, and reports on selected topics of applied and theoretical importance. Training in the use of chemical literature. Laboratory in quantitative organic analysis. Prerequisite: 531, and reading knowledge of German. (532) Winter. Lect. 2. Lab. 1, 3 hr. Credit 3. (533) Spring. Lect. 2. Credit 2.

535, 536, 537. **Advanced Organic Laboratory.** Involves preliminary research work in synthesis and a study of reactions of compounds of theoretical and industrial importance. Prerequisite: 333. Fall, Winter, Spring, respectively. Lab. 2 or more, 3 hr. Credit 2 or more each course.

545. **Special Topics in Food Chemistry.** Recent developments in food chemistry; detailed study of various food products. Prerequisite: 345. Fall, Winter, Spring Conference 2 or more Credit 2 or more each quarter.

565. **Special Topics in Textile Chemistry.** Recent developments in textile chemistry along technical lines. Prerequisite: 466. Fall, Winter, Spring. Conference 1. Lab. 2 or more, 3 hr. Credit 3 to 5.

571, 572, 573. **Advanced Physiological and Nutritional Chemistry.** Chemistry of internal secretions, oxidation, metabolism, nutrition, urine, blood, and tissues. Prerequisite: 275 or 474, and 321, and 531 as parallel. (571, 572) Winter, Spring, respectively. Lect. 2. Lab. 1, 3 hr. Credit 3 each course. (573) Fall. Lect. 3. Credit 3.

574, 575. **Physiological and Nutritional Chemistry.** Chemistry of digestion, assimilation, and metabolism; advanced nutritional chemistry. Methods of chemical diagnosis Prerequisite: 275 or 474. Winter, Spring, respectively. Lect. 2. Lab. 0 or 1, 3 hr. Credit 2 or 3 each course.

576. **Special Topics in Physiological Chemistry.** Physiological chemistry applied to dietetics, veterinary medicine, animal nutrition, bacteriology, etc. Prerequisite: 275 or 474. Fall, Winter, Spring. Conference. Lab. 2, 3 hr. or more. Credit 2 or more.

584, 585. **Industrial Zymo-Chemistry.** Chemistry of fermentations with especial reference to the elaboration of chemicals and other industrial materials from agricultural products. Prerequisite: 525, Bact. 560. Alternate years. Offered Winter, Spring, respectively, 1937. Rec. 2. Lab. 1 or more, 3 hr. Credit 3 or more each course.

586. **Bio-Chemistry.** A series of courses from which sequences may be chosen by graduate students in soils and the biological sciences as minors for the M.S. and Ph.D. degrees or as a part of their majors for either of these degrees.

Soils sequence.

(a) Minor for the M.S. degree
586F, C, and A.

(b) Minor for the Ph.D. degree:
586F, C, A, G, D, H, and I.

Biological Science sequence,

The following is a suggested sequence:

(a) Minor for the M.S. degree:
586F, C, and A.

(b) Minor for the Ph.D. degree:
586F, C, A, B, D, E, and G

Laboratory work.

All laboratory work involved in courses listed as 586, with the possible exception of 586J, will be scheduled in one laboratory which will be open each forenoon and afternoon, excepting Saturday afternoon, that there is a sufficient number of students to meet the minimum requirements.

A. Bio-organic Chemistry. Brief review of the fundamentals followed by more advanced bio-organic chemistry; training in the use of the literature. Prerequisite: 255. Winter. Lect. and rec. 3. Lab. 1 or 2, 3 hr. Credit 3 to 5. Mr. Hixon.

B. Bio-organic Chemistry. Continuation of A. introducing micro-chemical technique and analysis. Spring. Lect. and rec. 3. Lab. 1 or 2, 3 hr. Credit 3. Mr Hixon.

C. Bio-physical Chemistry. Interpretation and presentation of bio-chemical data Electro-chemistry as applied to biology. Prerequisite: 253, 256, 265, or 267. Fall. Lect. 3. Lab. 1, 3 hr. Credit 3 or 4. Mr. Fulmer.

D. Bio-physical Chemistry. General properties of solutions. Colloid chemistry. Prerequisite: 253, 256, 265, or 267. Winter. Lect. 3. Lab. 0 to 2, 3 hr. Credit 3 to 5. Mr. Fulmer.

E. Bio-physical Chemistry. Special topics. Prerequisite: 586D. Spring. Lect 2 Lab. 0 to 3, 3 hr. Credit 2 to 5. Mr. Fulmer.

F. Bio-inorganic Chemistry. Laws and theories relating to elements of special importance in plants, animals, and soils. Prerequisite: 256 or equivalent Fall Lect. 3. Credit 3. Mr. Clark.

G. Analytical Bio-chemistry. Advanced quantitative analysis involving methods for inorganic constituents of biological material. Prerequisite: 586F. Winter. Lect. 1. Rec. 1. Lab. 2 or 3, 3 hr. Credit 4 or 5. Mr. Clark.

H. Soil Chemistry. The soil organic matter and its composition. Prerequisite: 586G. Alternate years. Spring, 1936. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Clark.

I. Physical Chemistry of Soils. Reactions and colloids of the soil. Prerequisite: 586G. Alternate years. Spring, 1935. Lect. 2. Lab. 1, 3 hr. Credit 3. Mr. Clark.

J. Bio-chemical Laboratory. For the co-operative development of bio-chemical phases of research problems or the co-operative development of theses in borderland fields for the M.S. and Ph.D. degrees. Fall, Winter, Spring. Credit as arranged. Messrs. Fulmer, Hixon, Clark.

601, 602, 603. **Selected Topics in Inorganic Chemistry.** Atomic structure, periodic law, valency, ionization, rare elements, radiations, and chemical reactions, etc. Prerequisite: 202. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 2. Credit 2 each course. Mr. Brown.

605, 606. **Systematic Inorganic Chemistry.** Prerequisite: 202. Fall, Winter, respectively. Lect. 3. Credit 3 each course. Mr. Wilkinson.

616, 617. **Advanced Qualitative Analysis.** From the standpoint of mass law and equilibrium. Separation of common and rare elements. Prerequisite: 203, 213. Alternate years. Winter, Spring, respectively, 1937. Rec. 1. Lab. 2, 3 hr. Credit 3 each course. Mr. Wilkinson.

625. **Applied Physical Chemistry.** Advanced course on the theoretical considerations and industrial applications of free energy data, and other advanced topics. Prerequisite: 323. Fall, Winter, Spring. Lect. 2. Credit 2 each time elected. Mr. Jennings.

631, 632, 633. **Advanced Organic Chemistry.** Description and theoretical consideration of advanced reactions. Problems, abstracts, and term paper. Prerequisite: 531, reading knowledge of German. Fall, Winter, Spring, respectively. Credit 1 or 2 each course. Mr. Gilman.

655. **Special Topics in Plant Chemistry.** Carbohydrate chemistry. Isolation, analysis, synthesis, etc., of carbohydrate compounds or their fermentation products. Conference and lab. as arranged. Credit 3 or more. Mr. Hixon.

656. **Advanced Plant Chemistry.** Chemistry of plant metabolism, analysis of plant tissue, phytochemical preparations, preparatory training for research in plant growth phenomena. Prerequisite: 323, 333, and Botany 102. Alternate years. Offered Winter, 1937. Lect. and conference 3. Credit 3. Mr. Hixon.

658. **Soil Chemistry.** Physical, analytical, and bio-chemical methods; topic assignments. Prerequisite: 213, 323, 333. Fall, Winter, Spring Lect. and confer. 2 Lab. 1 or more. Credit 2 or more. Mr. Clark.

659. **Soil Chemistry.** Soil reaction and solution; colloids of the soil, organic matter; biometric methods. Prerequisite: 658. Fall, Winter, Spring. Lect. 2 or more. Credit 2 or more. Mr. Clark.

671, 672, 673. **Bio-Chemical Preparations.** Isolation, preparation and study of substances from living matter. Development of the experimental viewpoint of nutritional chemistry through animal feeding. Prerequisite: 275 or 474. Fall, Winter, Spring, respectively. Conferences and lab. as arranged. Credit 2 or more each course. Mr. Nelson.

686, 687. **Bio-Physical Chemistry.** Topic course dealing with the application of the principles and methods of physical chemistry to biology. Prerequisite: 525, and courses in biology. Alternate years. Offered Winter, Spring, respectively, 1938. Lect. 2. Lab. 0 or more, 3 hr. Credit 2 or more each course.

688. **Enzyme Chemistry.** Purification of enzyme material, enzymic action upon fats, carbohydrates, protein and other food substances. Preliminary training for research. Prerequisite: 525, and classification in 686. Winter, Spring. Conference 1. Lab. 1 or more, 3 hrs. Credit 2 or more. Miss Naylor.

695. **Research.**

A. Inorganic Chemistry. Messrs. Wilkinson, Brown, King.
B. Analytical Chemistry. Mr. Wilkinson.
C. Physical Chemistry. Mr. Jennings.
D. Organic Chemistry. Mr. Gilman.
E. Food and Sanitary Chemistry. Mr. Buchanan.
F. Bio-Physical Chemistry. Mr. Fulmer.
G. Physiological and Nutritional Chemistry. Mr. Nelson.
H. Household and Textile Chemistry. Miss Edgar.
I. Soil Chemistry. Mr. Clark.
J. Plant Chemistry. Mr. Hixon, Mr. Johns.
K. Enzyme Chemistry. Miss Naylor.
L. Dairy Chemistry. Mr. Buchanan, Mr. Bird.
M. Special Agricultural Chemistry. Mr. Hixon, Mr. Thomas.
N. Agricultural By-Products. Mr. Jacobs.

CIVIL ENGINEERING

A. H. FULLER, Head of Department

Professors Caughey, Dodds, Kerekes; Associate Professor Moyer; Assistant Professor Galligan; Instructors Logan, Paustian

For information concerning the Division of Engineering, see page 63.

Engineering has been aptly described as the science and art of applying, economically, the laws, forces, and materials of nature for the use, convenience, and enjoyment of man.

Civil Engineering consists of the economic application of the laws, forces, and materials of nature to the design and construction of highways; railways; bridges; large buildings; water supply, sewerage, irrigation and drainage systems; river and harbor improvements; and other works which are a part of the present day civilization.

An analysis of the positions of the C.E. graduates of Iowa State College shows about one-third of them to be in public work in U. S. Government, State, City and County positions. The others are widely scattered throughout the many phases of civil engineering in positions of all grades of engineering and administrative responsibility.

The curriculum in Civil Engineering has been planned with a foundation of English, mathematics, physics, and chemistry combined with drawing, surveying, mechanics, hydraulics, and economics and with a superstructure consisting of the applications of these subjects to the many phases of civil engineering. Emphasis is given to an understanding of the principles of engineering and of economics and the relation of these principles to efficient engineering practice.

The work on the campus is supplemented by a six-weeks summer camp, which follows the sophomore year; and by three informal inspection

trips for the purpose of making first-hand study of engineering work and of industrial plants of particular interest.

The summer camp has been located in the Minnesota State Forest Preserve on Rainy Lake. The camp site is one of America's few remaining spots of unspoiled natural wilderness. In this location is afforded an excellent opportunity for a combination of engineering experience and camp life.

For the inspection trips, the sophomores spend three days at Saint Paul, Minneapolis and Duluth, and on the Mesaba Iron Range, while enroute to summer camp. The juniors make one-day trips to Des Moines and adjacent places of engineering interest. The seniors spend a week in Chicago, St. Louis or other large centers of engineering activity. All of these trips are carefully planned in advance and are carried out under the joint direction of the faculty and of representatives of the work which is being inspected.

Curriculum in Civil Engineering

Leading to the degree of Bachelor of Science.
For graduate work, see page 91.
For professional degree, see page 82.
For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Applied Chemistry Chem. 107	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Project Draw. Engr. Dr. 132	3	Elementary Surveying C.E. 114	4
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E 105	1	Military 103 or 123	1
Military 101 or 121	1	Military 102 or 122	1		
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., C.E. 100 (Spring).

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Topographic Surveying C.E. 215	5	Working Drawings Engr. Dr. 133	3	Curves and Earthwork C.E. 264	4
		Hydrology and Drainage C.E. 220	3	Statics of Engineering T.&A.M. 274	3
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Extempore Speaking P.S. 311	3	Extempore Speaking P.S. 312	2	Engineering Problems Gen.E. 206	1
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	18		18		18

Summer Field Work in Topographic and Route Surveying, six weeks; C.E. 300—9 crs.
In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Roads and Pavements C.E. 355	4	Railway Engineering C.E. 364	4	Highway Adm. & Design C.E. 356	3
Mechanics of Materials T.&A.M. 324	5	Dynamics of Engineering T.&A.M. 344	4	Elements of Structures C.E. 335	5
Engineering Geology Geol. 374	3	Materials Laboratory T.&A.M. 327	2	Cement and Concrete T.&A.M. 338	3
Principles of Economics Ec. 261	3	Properties of Materials T.&A.M. 334	2	Hydraulics T.&A.M. 378	4
*Electives	3	General Bacteriology Bact. 304D	3	Electives	3
		Electives	3		
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, C.E. 394, 395, (Fall, Spring).

The Junior electives may be advanced courses in any of the non-civil engineering required subjects or any approved three-quarters sequence in a new subject. The electives must include English 204 unless a quality point average of 2 has been attained in the required courses in English and a correspondingly high standard has been maintained in subsequent written reports. See page 178.

*Appreciation of Art, C.C 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

• For information concerning the Reserve Officers' Training Corps, see page 244.

SENIOR YEAR

Bridge Analysis C.E. 436	5	Reinforced Concrete C.E. 437	5	Structural Analysis C.E. 439	5
Sewerage C.E. 414	5	Water Supply C.E. 415	3	Water Power C.E. 416	3
Engineering Reports C.E. 484	2	Engineering Valuation Engr. 407	3	Engineering Contracts Engr. 405	3
Engineering Construction C.E. 485	3	Accounting Ec. 374	4	Corporation Finance Ec. 474	3
*Electives	3	Electives	3	Electives	3
	18		18		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, C.E. 496, Fall; 497, Winter; Inspection Trip, C.E. 499, Spring.

*Elective courses shall be chosen after consultation with the counselor. Among the approved sequences for Junior electives are:

	Credits
Architectural Engineering 381, 382, 383	12
Electrical Engineering 435, 436, 437, 438	8
Government 315, 424, 435	9
History 234, 235, 421	9
Military Science 301, 302, 303	9
Modern Language 411, 412, 413	9
Modern Language 441, 442, 443	9
Psychology 204, 334, 424	9
Technical Journalism 225, 335, 435	9

The Senior electives will be chosen from:

Construction Materials T.&A.M. 498 or	Bridge Design C.E. 444 or	Reinforced Concrete Design C.E. 445 or
Public Works Management C.E. 405 or	Sewerage C.E. 417 or	Water Supply C.E. 418 or
Highways C.E. 456 or	Railroads C.E. 466 or	Transportation Surveys C.E. 477 or
Military Science 401	Military Science 402	Military Science 403

Description of Courses

100. **Technical Lecture.** A discussion of the various phases of civil engineering. Lectures by staff members and practicing civil engineers. Spring. Lect. 1. Required.

114. **Elementary Surveying.** Theory and practice of surveying including care and use of tape, compass, level and transit; field problems including profiles, cross sections, traverses, and area determinations. Prerequisite: Math. 102. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

116. **Surveying.** Elementary surveying problems; use of chain, compass, level and transit; field methods and notes. Prerequisite: credit or classification in Math. 102. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

215. **Topographic Surveying.** Centerline surveys, maps, plans, profiles and quantity calculations; triangulation; meridian determination; public land, aerial, underground, and hydrographic surveys. Prerequisite: 114 or 325. Fall. Rec. 2. Lab. 3, 3 hr. Credit 5.

217. **Topographic Surveying.** Leveling, traversing; plane table and other topographic surveys. Prerequisite: 116. Fall. Rec. 1. Lab. 3, 3 hr. Credit 4

218. **Surveying.** Calculations and office work. Prerequisite: 217. Winter. Rec 1. Lab. 2, 3 hr. Credit 3.

220. **Hydrology and Drainage.** Principles of hydrology and land drainage. Prerequisite: 215. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

264. **Curves and Earthwork.** Theory and practice in the location of curves on route surveys and in the measurement of earth work on construction projects. Prerequisite: 114. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

300. **Summer Camp.** Engineering field practice in camp during the first term of the summer quarter. Land, topographic, route, and hydrographic surveying. The student pays his own transportation and living expenses and the regular summer term registration fee. Prerequisite: 220, 264. Credit 9.

311, 312, 313. **Surveying.** (311) Level, transit and stadia. Prerequisite: 116. Fall. Rec. 1. Lab. 3, 3 hr. Credit 4. (312) Calculations and office work. United States Land Survey; hydrographic surveying. Prerequisite: 311. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4 (313) Topographic surveying including triangulation, use of plane table and meridian determinations. Prerequisite: 312. Spring. Rec 1. Lab. 2, 3 hr. Credit 3.

321, 322, 323. **Surveying.** (321) Elementary surveying. Pacing; uses of chain, tape, hand level, compass, engineer's level and transit; field methods and notes. Prerequisite: Math. 102. (322) Mapping calculations, and office work based on the work of 321; United States Land Subdivision; general surveying methods; the stadia. Prerequisite: 321. (323) Topographic surveying; uses of the plane table; meridian determinations. Prerequisite: 322. Fall, Winter, Spring, respectively. Rec. 1. Lab. 2, 3 hr. Credit 3 each course.

325. **Surveying.** Pacing; chaining; leveling; traversing; simple topography; care and use of instruments. Prerequisite: Math. 102. Fall and Spring. Rec. 1 Lab. 2, 3 hr. Credit 3.

330. **Mine Surveying.** Chaining, leveling, and traversing underground; use of mining transit. Prerequisite: 325. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

335. **Elements of Structures.** Stresses in beams, girders, and trusses; algebraic and graphic methods. Introduction to the design of steel structures Prerequisite T. & A.M. 324. Winter, Spring. Rec. 3 Lab. 2, 3 hr. Credit 5.

336. **Industrial Buildings.** Stress analysis and design of the main features of steel industrial buildings; design of timber truss and mill construction framing Prerequisite: 335. Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

354. **Roads and Pavements.** Types of roads and pavements, methods of construction and maintenance, special machinery, costs, comparisons Prerequisite: 218 or 325. Fall. Rec. 3. Credit 3.

355. **Roads and Pavements.** Theory and practice in design, construction, and maintenance. Road materials testing. Prerequisite: 215, Chem. 107. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

356. **Highway Administration and Design.** Design and financing of rural highways and city pavements. Elements of traffic control. Prerequisite: 264. Spring. Rec. 3. Credit 3.

364. **Railway Engineering.** Railway location based upon the maps made at summer camp. Construction, maintenance, and operation problems of the railway engineer. Prerequisite: 264. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

394. **Seminar.** Oral reports and discussions on engineering organizations and related topics. Fall. 1 hr. Required.

395. **Seminar.** Oral reports and discussions on notable engineering projects. Spring. 1 hr. Required.

404. **Engineering in City Planning.** The relation of sanitary works, transportation and other utilities to city planning; housing, building codes, real estate subdivision, land titles. Prerequisite: Credit or classfication in L.A. 401 or senior C.E. classification. Winter. Rec. 3. Credit 3.

405. **Public Works Management.** City and county finance, ordinances, special assessments, building codes, budgets, public relations, public health, public safety, zoning and planning. Prerequisite: credit or classification in 414. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

414. **Sewerage and Sewage Disposal.** Principles of sewerage and sewage treatment. Elements of design of sewage works. Correlated hydraulic laboratory experiments. Prerequisite: Bact. 304D, T. & A.M. 378. Fall. Rec. 3. Lab. 2, 3 hr. Credit 5.

415. **Water Supply.** Fundamentals of the collection, treatment, and distribution of water for public, domestic, and industrial uses. Elements of design of water supply works. Prerequisite: Bact. 304D, T. & A.M. 378. Winter. Rec. 2. Lab. 1. 3 hr. Credit 3.

416. **Water Power.** Rainfall, run-off, and stream flow and their application to water power developments; general principles of water power plant location and design; correlated hydraulic machinery laboratory tests. Prerequisite: T. & A.M. 378. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

417. **Advanced Sewerage and Sewage Disposal.** Principles of a sewage works plan, methods of plant control and value of experimental work in sewage treatment. Prerequisite: 414. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

418. **Advanced Water Supply.** Statistical methods applicable to study of surface sources. Quality of water trends, finances, Board of Fire Underwriters requirements and utilization of electricity as related to water supply. Prerequisite: 415. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

419. **Building Sanitation.** Piping systems for water supply and drainage. Principles of water treatment and waste disposal. Design of swimming pools and protection of bathing places. Prerequisite: 438. Winter. Rec. 3. Credit 3.

430. **Mine Surveying.** Precise surveying both surface and underground for mapping and boundary determinations in connection with mine and tunnel surveys; mining claims. Prerequisite: 330. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

436. **Bridge Analysis.** Stresses, investigation of design, and economic features of simple span steel highway bridges. Prerequisite: 335. Fall, Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

437. **Reinforced Concrete Structures.** Mechanics of reinforced concrete; designs and estimates of concrete structures; earth pressure theories and a brief treatment of foundations. Prerequisite: 335. Fall, Winter. Rec. 2 or 3. Lab. 2, 3 hr. Credit 4 or 5.

438. **Multistory Buildings.** Analysis and design of steel frame commercial buildings for which plans have been prepared in Arch. E. 491; preparation of typical framing plans. Prerequisite: 336, Arch. E. 491. Winter. Rec. 1. Lab. 2, 3 hr Credit 3.

439. **Advanced Structural Analyses.** Deflection of bridges; introduction to stresses in statically indeterminate structures; design of reinforced concrete arches. Prerequisite: 336 or 436, and 437. Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

444. **Bridge Design.** Stresses for railway loadings; design of steel highway and railway bridges; bridge specifications. Prerequisite: 436. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

445. **Reinforced Concrete Design.** Theory, design, and economics of concrete and masonry structures such as building frames, culverts, tanks, storm sewers, and bridges. Prerequisite: 437. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

456. **Highways.** Advanced highway design; economic studies of location and grades; super-highway projects; city street improvements; traffic control. Prerquisite: 355, 356. Fall. Rec. 3. Credit 3.

466. **Railroads.** Engineering and related problems in railway maintenance and operation. Prerequisite: 364. Winter. Rec. 3. Credit 3.

477. **Transportation Surveys.** Survey and analysis of the traffic problems of a specific locality with especial emphasis on the co-ordination of the transportation facilities. Prerequisite: 356, 364. Spring. Rec. 3. Credit 3.

484. **Engineering Reports.** Content and form of engineering reports; collection, assembly and interpretation of data; preparation of papers, letters, and reports Prerequisite: senior college classification. Fall. Rec. 2. Credit 2.

485. **Engineering Construction.** The application of some of the principles of scientific management to engineering construction. Prerequisite: 325 or equivalent, 335, T. & A.M. 338. Fall. Rec. 3. Credit 3.

490. **Advanced Civil Engineering.** Any phase of civil engineering in which the student has done exceptionally strong work. Prerequisite: permission of the department. Fall, Winter, Spring. Conferences. Credit 3 to 6.

496. **Seminar.** Oral reports on personal engineering experience. Supplemental biographical sketches of prominent engineers. Written outlines required. Fall. 1 hr. Required.

497. **Seminar.** Oral reports on modern construction methods and equipment. Written outlines required. Winter. 1 hr. Required.

499. **Senior Inspection Trip.** An inspection trip of one week to Chicago, St. Louis or other suitable place. Prerequisite: Senior C.E. classification. Spring. Required.

604. **Public Utilities.** A study from the standpoint of the city manager of the utilities which serve the modern city such as transportation, sanitation, light, heat and power, telephone, telegraph, and radio. Winter. Credit 4. Mr. Dodds.

605. **City Planning.** City planning from the view point of engineering improvements and their relation to other factors in promoting civic welfare. Prerequisite: 414 or L.A. 401. Spring. Credit 4. Mr. Dodds.

606. **Municipal Improvements.** Planning and execution of municipal improvements; sources of funds, federal co-operation, state regulation, auditing, legal procedure, and engineering. Fall. Credit 4. Mr. Dodds.

607. **Municipal Improvements.** Continuation of 606. Winter. Credit 3. Mr. Dodds.

608. **City Manager Problems.** Problems of the man who has charge of the engineering work of a city as city engineer, city manager, advisor to a city plan commission or consulting engineer dealing with the relation of the engineer to the public, to the other city officials, and to other engineers. Spring. Credit 3. Mr. Dodds.

614. **Sanitary Engineering Practice.** Organization and operation of sanitary engineering bureaus and health administration units. Fall. Credit 4. Mr. Galligan.

615. **Water Treatment.** Analysis of the design of modern water treatment plants with critical study of hydraulic features and plant performances. Winter. Credit 3. Mr. Galligan.

616. **Sewage Treatment.** Analysis of the design of modern sewage treatment plants with critical study of hydraulic features and plant performance. Spring. Credit 3. Mr. Galligan.

617. **Hydro-electric Project Analysis.** Controlling factors in a hydro-electric development, including market, financing, design, construction, operation, maintenance, administration. Winter. Credit 4. Mr. Galligan.

634. **Rigid Frames.** Theory and application of various methods of rigid frame analysis including curved beam theory, slope deflection, and moment distribution. Fall. Credit 4. Mr. Caughey.

635. **Office Buildings.** Problems peculiar to the design of office buildings such as stresses in wind bracing, design of spandrel girders, grillage foundations, and floors of various types. Winter. Credit 4. Mr. Caughey, Mr. Kerekes.

636. **Secondary Stresses.** The underlying principles of secondary stresses in framed structures and the design of structures to avoid excessive secondary stresses. Spring. Credit 4. Mr. Fuller.

637. **Industrial Buildings.** Problems peculiar to the design of industrial buildings, such as eccentrically loaded members of framed bents, framed bents with side sheds, and balconies attached to main columns. Fall. Credit 3. Mr. Caughey, Mr. Kerekes.

638. **Storage Structures.** The design of grain elevators and other storage structures, including a study of the behavior of various materials in bins and tanks. Spring. Credit 3. Mr. Caughey.

639. **Airport Structures.** Stress analysis and design of hangars, shops and terminal buildings. Prerequisite: 335 or M.E. 420. Credit 5. Mr. Kerekes.

644. **Space Structures.** An introduction to rigorous analysis of complete structures in three planes. Principles, methods and the interpretation of results of stress measurements and deflections. Messrs. Caughey, Fuller, Kerekes.

645. **Highway Pavement Slabs.** An introduction to the analysis of stresses in highway pavements under various subgrade conditions. Interpretation of the behavior of slabs in the laboratory and in service. Messrs. Caughey, Fuller, Kerekes, Spangler.

650. **Highway Safety and Traffic Control.** Principles in highway safety which should be considered in the design of highways and city streets, and traffic control devices. Methods and results of motor vehicle inspection, driver's examinations, and related enforcement measures as a means of promoting highway safety. Summer. Credit 4. Messrs. Moyer, Lauer.

654. **Rural Highway Design.** Economic studies in rural highway location, alignment, and grades. Economic comparisons of roadway surfaces. Design of traffic control devices. Fall. Credit 4. Mr. Moyer.

655. **Highway Administration.** Engineering considerations involved in the selection, improvement, and maintenance of highway systems. Winter. Credit 4. Mr. Moyer.

656. **Highway Jurisprudence.** Relation of highway laws and systems of finance to the work of the highway engineer. Spring. Credit 4. Mr. Moyer.

657. **Highway Materials.** Selection, testing, and utilization of materials for highway construction. Fall. Credit 3. Mr. Moyer.

658. **Design of Street Improvements.** Design of pavements, curbs, drainage accessories, intersections, marking systems, lighting, and devices for traffic regulation. Winter. Credit 3. Mr. Moyer.

659. **Highway Specifications.** Preparation of specifications for highway improvements in accordance with state and national standards. Spring. Credit 3. Mr. Moyer.

664. **Economics of Railway Location.** Economic study of a railway location taking into account rise and fall, distance, curvature, type of power and traffic possibilities. Fall. Credit 4. Mr. Moyer.

674 **Airport Design.** Selection of site, layout of airports, design of coverage for runways and fields, air and surface traffic aids. Prerequisite: 325, 355. Credit 4. Mr. Stewart.

677. **Transport Surveys.** Analysis of operation of transportation agencies. Fall. Credit 4. Mr. Moyer.

679. **Co-ordinated Transportation Systems.** Engineering and transport problems encountered in the co-ordination of railway, highway, waterway and airway traffic Spring. Credit 4. Mr. Moyer.

690. **Research.** Messrs. Caughey, Dodds, Fuller, Galligan, Kerekes, Moyer, Schlick, Spangler.

CO-OPERATIVE COURSES

R. M. HUGHES, President
In Charge

It is increasingly apparent that technical students as well as others need training in college which will enable them to appreciate and apply the principles of art in their professional work. Such training will also enable them to enjoy life more fully and to take a more active part in its wider activities. Accordingly, the College has introduced the following courses which are administered by special committees under the general direction of the President.

Appreciation of the Arts

Committee Members: Anson Marston, Senior Dean of Engineering, Chairman; Professors Cox, Elwood, Joanne Hansen, Kimball; Associate Professors Mabel Fisher, O'Bryan; Assistant Professors Kooser, Livingston, Phillips; Instructors D. P. Ayres, Mrs. Ness

A special art collection purchased by a $5000 Carnegie Corporation grant for this purpose furnishes the materials for the course. Large colored reproductions and colored lantern slides are used extensively.

Description of Courses

401, 402, 403. **Appreciation of the Arts.** A course of 31 weekly presentations and discussions of examples of art as expressed in architecture, landscape architecture, painting, sculpture, and the wood, metal, ceramic and textile crafts. The art subjects are presented and explained by a staff of members of the Appreciation of the Arts Committee, with some outside assistance. Prerequisite: senior college classification. Fall, Winter, Spring. Lect. 1 (no outside preparation). Total credit 1.

See also A. A. 484, Art Appreciation, p. 196.
Arch. E. 351, 352, 353. History of Architecture, p. 131.
Arch. E. 384, 385, 386. Principles of Architectural Design, p. 131.
Mus. 144, Music Appreciation, p. 248.

National, State, Regional and Town Planning

Committee Members: Professor P. H. Elwood, Chairman; Deans Agg, Kildee; Professor T. W. Schultz

The benefits and limitations of planning should be familiar to all technical and professional students. Intelligent co-operation of Agriculturists, Architects, Conservationists, Economists, Engineers, Foresters, Landscape Architects, Town Planners, Sociologists, and other scientists is fundamental and essential. Each should find his most effective niche in the complex pattern of the future.

The experience of the past, the trend of the present and the possible future developments in the broad field of planning will be presented in this series by leaders in the various professions involved.

Description of Course

414. **National, Regional, State and Town Planning.** A series of lectures on collaborative planning aimed to present in outline form the rational approach and the essentials of the various elements as well as the need for mutual understanding and helpful co-operation to insure future physical, economic and social welfare. Prerequisite: senior college classification. Winter. Lect. 2. Credit 2.

DAIRY INDUSTRY

M. MORTENSEN, Head of Department

Professors Hammer, Iverson; Associate Professor Goss; Assistant Professors Baker, Bird; Instructors Fabricius, Hostetler, Olson, Te Selle; Assistants Duncan, Nielsen

Extension Workers Bouska, Cromer, Rudnick, Weaver, Wester

For information concerning the Division of Agriculture, see page 58.

The Department of Dairy Industry offers a four-year curriculum which qualifies students to become competent teachers and investigators in agricultural colleges and experiment stations; inspectors of dairy products and dairy establishments in municipal, state, and government service; or superintendents and managers of creameries and other dairy establishments. The Dairy Industry Department occupies a building with modern laboratories and equipment. The milk from the college herd, together with the milk and cream shipped and hauled to the college, supplies all needs of the manufacturing laboratories.

Curriculum in Dairy Industry

Leading to the degree of Bachelor of Science.

Six months of practical work under the direction of the department is required before graduation. See page 117.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Livestock Problems A.H. 101[1]	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Dairy Mechanics A.E. 157	2	General Botany Bot. 101	3	General Horticulture Hort. 114	3
Farm Dairying D.I. 114	4	**Mathematics Math. 205	4	Physics Phys. 204	3
Military 121	1	Military 122	1	Military123	1
	16		17		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., D.I. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

**College Algebra, Math. 101 (5), may be substituted for Math. 205.
[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Cheese Making D.I. 115	5	Milk Test. & Inspection D.I. 116	3	American Government Govt. 214	3
Breeds of Livestock A.H. 201	3	Poultry Husbandry A.H. 144	3	Poul. Pack. Plant Probs. A.H. 146	3
Organic and Quantitative Chem. 251	3	Organic and Quantitative Chem. 252	3	Bio-Chemistry Chem. 253	3
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Extempore Speaking P.S. 311	2	Dairy Machinery A.E. 239	5	Reasoning & Writing Engl. 205	3
Military 221	1	Military 222	1	Extempore Speaking P.S. 312	2
				Military 223	1
	17		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Judging Dairy Products D.I. 307	1	Dairy Bacteriology D.I. 350	6	Ice Cream and Ices D.I. 306	4
General Bacteriology Bact. 304A	5	Dairy Chemistry Chem. 348	5	Manufacture of Butter D.I. 304	5
Dairy Chemistry Chem. 347	5	Elementary Accounting Ec. 370	4	Market Milk D.I. 305	3
†Dairy Cattle Feed. & Mgt. A.H. 337	3	Electives	2	Butter Cultures D.I. 507	2
General Farm Crops F.C. 324	4			Creamery Accounting Ec. 330	3
	18		17		17

SENIOR YEAR

Condensed Milk Prod. D.I. 404	4	Mgt. of Dairy Plants D.I. 504	6	Economic History Hist. 324	3
Seminar D.I. 505	2	Dairy Industry Review D.I. 506	3	Agricultural Advertising T.Jl. 325	2
Principles of Breeding A.H. 454	3	Feature Writing T.Jl. 335	3	Soil Fertility Soils 364	3
Business Law Ec. 365	3	Electives	5	Business Correspondence Engl. 404	2
Technical Journalism T.Jl. 225	3			Electives	7
Electives	2				
	17		17		17

†May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 244.
Advised Electives—L.A. 206 (2); F.C. 404 (3).
The following elective subjects are suggested for students specializing in commercial work: A.H. 440; D.I. 308, 309, 554, 555, 556, 557; Ec. 304, 540; Psych. 204, 438, 464, 484.

Curriculum in Dairy Industry and Chemistry

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 36.

Six months of practical work under the direction of the department is required before graduation. See page 117.

There is an increasing demand for men who are qualified to do research in dairy industry. Such men should be well prepared in the fundamental sciences, such as chemistry, bacteriology, physics, and mathematics. In order to prepare students for that field of work a four-year curriculum is offered by the Departments of Dairy Industry and Chemistry.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Livestock Problems A.H. 101[1]	2	Farm Dairying D.I. 114	4	Livestock Problems A.H. 103	2
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	Plane Analytic Geometry Math. 103	5
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
General Botany Bot. 101	3	Military 122	1	Speech Training P.S. 104	2
Military 121	1			Military 123	1
	18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., D.I. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

SOPHOMORE YEAR

Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	3
Cheese Making D.I. 115	5	Milk Test. & Inspection D.I. 116	3	Reasoning & Writing Engl. 205	3
Differential Calculus Math 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
General Physics Phys. 211	4	General Physics Phys. 212	4	General Physics Phys. 213	4
Military 221	1	Military 222	1	American Government Govt. 214	3
				Military 223	1
	18		16		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Organic Chemistry Chem. 331	5	Organic Chemistry Chem. 332	5	Organic Chemistry Chem. 333	5
Judging Dairy Products D.I. 307	1	Dairy Bacteriology D.I. 350	6	Manufacture of Butter D.I. 304	5
General Bacteriology Bact. 304A	5	†French or German M.L. 202 or 232	4	Ice Cream and Ices D.I. 306	4
Technical Journalism T.Jl. 225	3			†French or German M.L. 203 or 233	4
†French or German M.L. 201 or 231	4				
	18		15		18

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

†May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 244. French or German must be taken later in the curriculum.

SENIOR YEAR

Condensed Milk Prod. D.I. 404	4	Management of Dairy Plants D.I. 504	6	Market Milk D.I. 305	3
Seminar D.I. 505	2	Dairy Chemistry Chem. 348	5	Electives	14
Bact. of Butter & Cheese D.I. 556	2	Electives	6		
Lab. Bact. of Butter and Cheese D.I. 557	2				
Dairy Chemistry Chem. 347	5				
Electives	2				
	17		17		17

Students desiring to major in Dairy Chemistry should elect Physical Chemistry 321, 322, 323 in their Senior year

Curriculum in Dairy Industry and Economics

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 36.

Six months of practical work under the direction of the department is required before graduation. See page 117.

Opportunities are presented in modern dairy organization for men who have a thorough technical knowledge of dairy industry and who are also well trained in applied economics. This training, together with subsequent successful practical experience, should prepare men for responsible executive and administrative positions in the commercial field.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	Plane Analytic Geometry Math. 103	5
Farm Dairying D.I. 114	4	Physics Phys. 204	3	Livestock Problems A.H. 103	2
Military 121	1	Military 122	1	Military 123	1
	17		16		15

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., D.I. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

SOPHOMORE YEAR

Breeds of Livestock A.H. 201	3	Poultry Husbandry A.H. 144	3	Poul. Pack. Plant Probs. A.H. 146	3
Organic and Quantitative Chem. 251	3	Organic and Quantitative Chem. 252	3	Bio-Chemistry Chem. 253	3
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Cheese Making D.I. 115	5	Milk Test. & Inspection D.I. 116	3	American Government Govt 214	3
Extempore Speaking P.S. 311	2	Dairy Machinery A.E. 239	5	Reasoning & Writing Engl. 205	3
Military 221	1	Military 222	1	Extempore Speaking P.S. 312	2
				Military 223	1
	17		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Judging Dairy Products D.I. 307	1	Dairy Bacteriology D.I. 350	6	Ice Cream and Ices D.I. 306	4
Dairy Chemistry Chem. 347	5	Adv. Dairy Chemistry Chem. 348	5	Manufacture of Butter D.I. 304	5
General Bacteriology Bact. 304A	5	Money and Banking Ec. 304	3	Market Milk D.I. 305	3
Dairy Cattle Feed. & Mgt. A.H 337	3	Elementary Accounting Ec. 370	4	Butter Cultures D.I. 507	2
General Farm Crops F.C. 324	4			Creamery Accounting Ec. 330	3
	18		18		17

SENIOR YEAR

Condensed Milk Prod. D.I. 404	4	Manage. of Dairy Plants D.I. 504	6	Market Price Determination Ec. 538	3
Seminar D.I, 505	2	Dairy Industry Review D.I. 506	3	Business Correspondence Engl. 404	2
Principles of Breeding A.H. 454	3	El. Economic Statistics Ec. 234	4	Economic History Hist. 324	3
Business Law Ec. 365	3	Feature Articles T.Jl. 335	3	Technical Advertising T.Jl. 325	2
Technical Journalism T.Jl. 225	3	Electives	1	Soil Fertility Soils 364	3
Advanced Accounting Ec. 375	3			Electives	4
	18		17		17

Description of Courses

For description of non-collegiate courses, see page 290.

110. **Technical Lecture.** The field of dairy industry, its opportunities, requirements and organization. Spring. Lect. 1. Required.

114. **Farm Dairying.** Development and organization of the dairy industry, composition and properties of milk, methods of manufacturing dairy products and improving their quality. Fall, Winter, Spring. Lect. 3. Lab. 1, 3 hr. Credit 4.

115. **Cheese Making.** Selection of milk; manufacture and curing raw and pasteurized milk cheddar; cream, neufchatel, and cottage; marketing. Prerequisite: 114. Fall. Lect. 3. Lab. 1, 6 hr. Credit 5.

116. **Testing and Inspection of Milk and its Products.** Tests for fat, solids, acidity preservatives, etc., used in the dairy plant and milk control laboratory; use of Mojonnier tester. Prerequisite: 114. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.

304. **Manufacture of Butter.** Separation of milk for buttermaking, preparation of starters, and ripening and churning of cream. Prerequisite: 116 except for Dy. Husb. students. Spring. Lect. 3. Lab. 3, 2 hr. Credit 5.

305. **Market Milk.** Sanitary production and processing of the milk supply; milk inspection systems and marketing of milk. Prerequisite: 116 and 350; 350 for Dairy Husbandry students. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

306. **Manufacture of Ice Cream and Ices.** Care and preparation of materials used. Plain and fancy ice creams and related products. Prerequisite: 116. Spring. Lect. 3. Lab. 1, 3 hr. Credit 4.

307, 308, 309. **Judging Dairy Products.** Milk, cheese, butter, and ice cream. (307) Fall. (308) Spring. (309) Fall. Lab. 1, 3 hr. Credit 1 each course.

310. **Dairy Principles.** The obtaining of milk, processing and handling of milk and other dairy products from the viewpoint of the agricultural engineer. Alternate years. Offered Spring, 1937. Lect. 2. Credit 2.

350. **Dairy Bacteriology.** (Bact. 350.) Bacteria in milk and its derivatives; the production and handling of dairy products from the hygienic viewpoint. Prerequisite: Bact. 304A. Winter. Lect. 4. Lab. 3, 2 hr. Credit 4 or 6.

404. **Condensed Milk Products.** Manufacture of condensed and powdered milks, casein, milk sugar, whey butter and oleomargarine. Prerequisite: 116. Fall. Rec. 3. Lab. 1, 3 hr. Credit 4.

405. **Milk Inspection.** Testing of milk and cream by the Babcock methods. Inspection of milk and milk products. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

406. **Commerical Dairying.** Control tests and methods used in the operation of commerical dairy plants; inspection work; construction, operation, and the management of dairy plants from the viewpoint of the producer and county agent. Prerequisite 114. Alternate years. Offered Fall, 1937. Rec. 3. Lab. 1, 3 hr. Credit 4.

407. **Special Problems in Dairy Manufacturing.** Advanced work in some special phase of dairy products manufacturing. Prerequisite according to the topic selected. Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

450. **Special Dairy Bacteriology.** (Bact. 450.) Laboratory investigations, assigned readings and reports on bacteriological problems relating to dairying. Prerequisite: 350. Fall, Winter, Spring. Credit 2 to 6.

504. **Management of Dairy Plants.** Organization, construction, and operation of dairy establishments. Prerequisite: 304, 305, 306. Winter. Rec. 5. Lab. 1, 3 hr. Credit 6.

505. **Seminar.** Advanced work in dairy problems and reviews of experiment station work. Prerequisite: 504. Fall. Lect. 2. Credit 2.

506. **Dairy Industry Review.** A review of technical subject matter followed by a final examination. Prerequisite: 350, 504, Chem. 348. Winter. Rec. 3. Credit 3.

507. **Butter Cultures.** Judging and propagating; development from pure cultures of organisms. Prerequisite: 350. Spring. Rec. and lab. 2, 2 hr. Credit 2.

508. **Foreign Varieties of Cheese.** Selection of milk, manufacture, curing, and marketing of Swiss, brick, Limburger, Roquefort, Camembert, etc. Special attention given to cultures and control of curing. Prerequisite: 115. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

554. **Bacteriology of Milk.** (Bact. 554.) The various problems in connection with the handling and supervision of milk supplies. Prerequisite· 350. Spring. Lect. 2. Credit 2.

555. **Laboratory Work in Bacteriology of Milk.** (Bact. 555.) To accompany 554 Spring. Lab. 3, 2 hr. Credit 2.

556. **Bacteriology of Butter and Cheese.** (Bact. 556.) The desirable and undesirable bacteriological changes occurring in cream intended for butter making and in butter and cheese. Prerequisite: 350. Fall. Lect. 2. Credit 2.

557. **Laboratory Work in Bacteriology of Butter and Cheese.** (Bact. 557.) Outlined to accompany 556. Fall. Lab. 3, 2 hr Credit 2.

600. **Dairy Production in Foreign Countries.** Development of dairying in the various countries and the world markets for dairy products. Prerequisite: 504. Alternate years. Offered Spring, 1937. Rec. 2. Credit 2. Mr. Mortensen.

604, 605. **Conference in Dairy Manufacturing.** Recent developments in the manufacture of butter and ice cream. Alternate years. (604) Offered Fall, 1936. Lect. 1. Credit 1. (605) Offered Spring, 1937. Lect. 1. Credit 1. Mr. Mortensen, Mr. Iverson.

606. **Research in Manufacture of Butter.** Prerequisite: 304. Mr. Mortensen, Mr. Bird.

607. **Research in Manufacture of Ice Cream.** Prerequisite: 306. Mr. Iverson, Mr. Bird.

608. **Research in Market Milk.** Prerequisite: 305. Mr. Hammer.

609. **Research in Manufacture of Cheese.** Prerequisite: 115. Messrs. Goss, Hammer, Bird.

625. **Research in Management of Dairy Plants.** Prerequisite· 504. Mr. Mortensen, Mr. Goss.

650. **Conference in Dairying.** Reports and discussions on current investigations. Mr. Hammer.

655. **Conference in Dairy Bacteriology.** (Bact. 655.) Discussions of bacteriological problems relating to the various phases of dairying. Spring. Lect 2. Credit 2. Mr. Hammer.

656. **Identification of the Organisms Common in Dairy Products.** (Bact. 656.) Identification and relationships of the desirable and undesirable organisms commonly encountered in dairy products. Fall. Lect. 2. Lab. 3, 2 hr. Credit 4. Mr. Hammer, Mr. Baker.

660. **Seminar.** Reports on investigational work at Iowa State College and elsewhere. Spring. Lect. 1. Credit 1. Mr. Hammer.

690C. **Research in Dairy Bacteriology.** (Bact. 690C.) Prerequisite: 350. Messrs. Hammer, Baker, Olson.

ECONOMICS AND SOCIOLOGY

T. W. SCHULTZ, Head of Department

Professors Fuller, Hoyt, Von Tungeln; Associate Professors Allbaugh, Benedict, Harter,* Hopkins, Murray,* Robotka, Shepherd, Thomson, Wakeley, Wright; Assistant Professors Manning, Reid, Schrampfer, Bentley, Wilcox; Instructors Cook, Bowman, Dachtler, Elkinton, Prugh, Quintus, Schickele; Graduate Assistants Davies, Foote, Greaves, Griffin, McCroy, Meyer, Strand

For information concerning the Division of Industrial Science, see page 69.

The department offers major work in the following fields: Agricultural Economics (including agricultural business and farm organization and management); General Economics (including consumption economics); Industrial Economics (including engineering economics); Rural Sociology.

The department seeks to analyze and present to students the nature of economic and social forces as they affect the value of agricultural and industrial commodities and the well-being of the farming and urban population, and to teach the principles underlying individual and social adjustment to these forces. Major work is offered in the following four curricula:

Curriculum in Agricultural Economics. See page 104

Curriculum in General Science—Major in General Economics

This curriculum is designed for those students who desire an education that is well balanced in respect to the sciences and general studies, particularly as they relate to the home, teaching, intelligent citizenship, and further scientific or professional study.

For freshman and sophomore years, see page 228.
For junior and senior years, see page 229.

Curriculum in Industrial Science—Major in Industrial Economics

This curriculum is designed for those students who are interested in certain specialized fields of scientific activity, particularly as they relate to the practical aspects of industry, commerce, and engineering.

For freshman and sophomore years, see page 226.
For junior and senior years, see page 227.

Curriculum in Rural Sociology. See page 105

*Description of Courses

*Only one of the following Economic courses may count for credit toward graduation: 201, 211, 231, and 261; and the same rule applies to 202, 212, 232, and 262; 203, 213, 233, and 263.

110. **Technical Lecture.** The field of agricultural economics and rural sociology. Spring. Lect. 1. Required.

201, 202, 203. **Principles and Problems of Economics.** For Industrial Science students. Not open to freshmen. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

*Absent on leave.

211, 212, 213. **Principles of Economics.** Including consumption. For Home Economics students. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

231, 232, 233. **General Agricultural Economics.** (231) Farm Organization and Management. A consideration of the economic factors involved in the successful organization and operation of a farm. Fall, Winter. (232) Principles of value and price developed in connection with farm marketing problems; marketing methods; market price; supply and demand and their determinants; elasticity of demand and supply. Prerequisite: 231 or equivalent. Winter, Spring. (233) Principles of distribution developed around the problems of farm income, cost of production and price, labor and wages, savings and interest, land and rent, profits as a reward for business enterprise, and risk taking. Prerequisite: 232. Fall, Spring. Rec. 3. Credit 3 each course.

234. **Elementary Economics Statistics.** The principles and methods of gathering, analyzing, presenting, and interpreting economic data. Fall, Winter. Rec. 3. Lab. 1, 3 hr. Credit 1 or 4. Students who are classified in or have received credit in Math. 441 may enroll in the laboratory of this course for 1 credit. In all other cases both recitation and laboratory will be required.

261, 262, 263. **Principles and Problems of Economics.** For Engineering students. Not open to freshmen. (261) Fall, Winter, Spring. (262) Winter, Spring. (263) Spring. Rec. 3. Credit 3 each course.

304. **Money and Banking.** Principles of money and credit; survey of American financial institutions; practical operations of commercial banks. Prerequisite: 201 or equivalent. Fall, Winter, Spring. Rec. 3. Credit 3.

330. **Creamery Accounting.** Specialized accounting systems for creameries. Construction and interpretation of creamery operating statements and balance sheets. Prerequisite: 370 or equivalent. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

334. **Land Economics.** Problems in land ownership. Land tenure. Factors affecting the value of farm land. Selling practices. Regional changes in land utilization. Prerequisite: 233 or equivalent. Fall. Rec. 3. Credit 3.

335. **Co-operation in Agriculture.** The co-operative type of business enterprise with particular reference to its application in farm marketing. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

336. **Farm Management and Accounting.** Principles of farm organization and management applied to Iowa farming. Technique of farm management including the use of farm accounting data. Prerequisite: 233 or equivalent. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

365. **Business Law.** Fundamental principles of law as applied to business transactions. Fall, Winter, Spring. Rec. 3. Credit 3.

366. **Advanced Business Law.** Continuation of 365. Emphasis on credit transactions, employment relations, non-contractual rights and liabilities. Prerequisite: 365. Winter. Rec. 3. Credit 3.

370. **Elementary Accounting.** Fundamental accounting principles common to all business enterprises. Winter, Spring. Rec. 2. Lab. 1 or 2, 3 hr. Credit 3 or 4.

374. **Accounting.** Preparation and analysis of balance sheet and profit and loss statement. Double entry bookkeeping, significance of assets, liabilities, expenses, and incomes. Prerequisite: 261 or equivalent and senior college classification. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

375. **Advanced Accounting.** Analysis of financial statements, application of accounting methods as an instrument of business control. Prerequisite: 370 or 374. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

376. **Cost Accounting.** Methods of determining and analyzing costs of materials; processes of labor and machines; distribution of direct and overhead costs; preparation of cost reports. Prerequisite: 370 or 374. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

384. **Applied Sociology.** Means and measures of social assimilation, social adaptation, and social control as related to social progress. Fall, Winter, Spring. Rec. 3. Credit 3.

385. **Applied Sociology.** History, development and status of the family with special reference to influences affecting American family life. Fall. Winter, Spring. Rec. 3. Credit 3.

386. **Introduction to Rural Sociology.** Rural social problems. Development and functioning of basic rural social institutions. Cultural backgrounds, standards and methods as related to co-operative efforts and social change. Fall, Winter Spring. Rec. 3. Credit 3.

396. **Forest Finance.** (For. 396.) Appraisal of forest land and stumpage. Determination of the profit of forests compared with other land uses. Land classification, forest taxation and credit. Prerequisite: 231. Spring. Rec. 4. Credit 4.

406. **Industrial Relations.** Relations of employer and employee under present conditions of industry. Matters of public policy such as labor legislation and social insurance. Prerequisite: 202 or equivalent. Winter. Rec. 3. Credit 3.

430. **Practice Course in Marketing.** Study of the methods and practices of a market agency while the student is in its employ. Written plans and reports. Prerequisite: permission of instructor. Credit 1 to 3.

438. **Lumber Markets.** (For. 438.) Economics of the timber industry. Wholesaling and retailing. Exports and imports of lumber and other forest products; prices; lumbermen's associations; freight rates; etc. Prerequisite: 231. Winter. Lect. and rec. 4. Credit 4.

470. **General Forestry Economics.** (For. 470.) Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests. Prerequisite: 231. Spring. Rec. 3. Credit 3.

474. **Corporation Finance.** Principles of financial organization and management. Types of corporate securities, financing of new corporations and their later management, and reorganizations. Prerequisite: 261 or equivalent. Antecedents suggested: 262, 374. Fall, Spring. Rec. 3. Credit 3.

480. **Industrial Sociology.** Study and evaluation of leadership and welfare work in industry—industrial health, housing, recreation, retirement pensions, unemployment insurance, joint-representation and management, stabilization, etc. Winter, Spring. Rec. 3. Credit 3.

484. **Recreational Activities.** Theory and practice in making and supervising recreational programs to develop voluntary leaders for group recreation and to strengthen community organization. Prerequisite: 384 or equivalent. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

499. **Special Problems.** Prerequisite: Ec. 203 or equivalent, and 386 for Rural Sociology. As arranged. Fall, Winter, Spring. Credit 1 to 5.

A. Agricultural Economics.

B. Consumption Economics.

C. Industrial Economics.

D. Rural Sociology.

500. **International Economics.** International division of labor, comparative costs, distinguishing features of international transactions, comparative price levels, foreign exchanges, balance of trade, tariffs. Prerequisite: 203 or equivalent. Winter. Rec. 3. Credit 3.

504. **Money and Banking.** American banking history; structure and operations of the Federal Reserve System; American monetary and banking policies; credit control. Prerequisite: 203 or equivalent. Winter. Rec. 3. Credit 3.

505. **Public Finance.** Taxation, public debts, and public expenditures with special reference to state and local finance. Prerequisite: 203. Fall. Rec. 3. Credit 3.

507, 508. **Value and Distribution.** Value determining forces as applied to both general commodities and production goods and services. Prerequisite: 203. Winter, Spring, respectively. Rec. 3. Credit 3 each course.

510. **Land Use.** Elementary outlines of land economics. Landlord-tenant relationships. Absentee landlordism. Land values and taxations. Public finance of local governments. Land classification. Rural zoning. Prerequisite: 203 or equivalent. Credit 3 or 4. Summer.

514. **Economics of the Household.** Economic significance of productive services of household and problems of household as a field of national production. Prerequisite: 212. Fall. Rec. 3. Credit 3.

515. **Consumers' Marketing.** Economic forces affecting the market, with special reference to consumers' goods. Prerequisite: 213. Winter. Rec. 3. Credit 3.

516. **Standards of Living.** American and foreign scales and standards of living. The influences creating them, their cultural significance. Prerequisite: 213. Spring. Rec. 3. Credit 3.

517. **Housing.** (H. Mgt. 517.) Expenditures, factors affecting demand for and supply of housing, regulations pertaining to housing, house ownership, organizations promoting better housing. Prerequisite: 212. Spring. Rec. 3. Credit 3.

518. **Family Finance.** (H. Mgt. 518.) Earning and spending income to increase its adequacy and insure economic security. Budgeting, accounting, consumer's credit, investments, control of property. Prerequisite: 212. Winter Spring. Rec. 2. Credit 2.

530. **Advanced Farm Organization and Management.** Technique of farm organization and management, particularly as developed in Iowa farming. Prerequisite. 233 or equivalent. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3.

534. **Farm Accounting.** Principles of accounting adapted to the farm business. Application of accounting data to farm management. Prerequisite: 233, 370. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

535. **Agricultural Finance.** Financial requirements of individual farmers and of farmers' marketing and purchasing organizations. Credit institutions serving farmers and their organizations. Prerequisite: 233 or equivalent. Winter. Rec. 3. Credit 3.

536. **Prices of Farm Products.** Agricultural prices including an analysis of their characteristic movements and their position relative to the general price level in the business cycle. Prerequisite: 233. Spring. Rec. 3. Credit 3.

537. **Statistical Analysis.** Correlation analysis; methods of analysis of prices, production data and similar series of time variables. Prerequisite: 234 or Math. 441. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

538. **Market Price Determination.** Price making in the market place. Relationship among farm wholesale and retail prices. Speculation and prices. Prerequisite: 233 or equivalent. Spring. Rec. 3. Credit 3.

539. **Structure of Agricultural Markets.** Relation of the middleman system to farmers on the one hand and processors or consumers on the other. Prerequisite: 233 or equivalent. Spring. Rec. 3. Credit 3.

540. **Economic Geography of Agriculture.** Geographic and economic survey of the conditions under which the world's supplies of agricultural products are obtained; trade routes; centers of trade in agricultural products. Prerequisite· 233 or equivalent. Winter. Rec. 3. Credit 3.

545. **Transportation.** Development of means of transportation including highways, waterways and railways: relation of transportation to agriculture, general industry, and the formation of market centers. Prerequisite· 203. Fall, Spring Rec. and lect. 3. Credit 3.

546. **Railway Traffic and Rates.** Theory and practice of rate making and regulation: traffic practice and problems; effect of rates on production and trade. Prerequisite: 545. Winter. Rec. 3. Credit 3.

547. **Agricultural Policy.** The relation of agriculture to the economic life of the nation. Problems arising out of the agricultural and industrial development. Prerequisite: 233 or equivalent Fall. Rec. 3. Credit 3.

550. **Land Income and Policy.** Land as a factor of production. Economics of land utilization. Theories of rent. Principles of land valuation and taxation. Educational policies pertaining to land use. Conservation Legislation Recent tendencies in land use planning. Prerequisite· 203 or equivalent. Credit 3. Summer.

560. **Economics of Public Utilities.** To acquaint the student with the development, economic characteristics, and management of public utilities. Prerequisite: 203 or equivalent, 374. Spring. Rec. 3. Credit 3.

564. **Corporate Organizations.** Organization and control of corporations and other forms of business. Procedure of incorporation, relationships of the parties in the corporation, and combinations of corporations in large industries and utilities Prerequisite: 261 or equivalent, 365, 374. Spring. Rec. 3. Credit 3.

568. **Industrial Marketing.** From the standpoint of the manufacturer. Merchandising channels, sales organization, sales engineering, and co-ordination of sales and production Prerequisite: 263, 374. Winter. Rec. 3 or 5. Credit 3 or 5

575. **Investments.** Security prices and yields; essential investment feature of various corporate securities—risk, income, control, etc ; methods of testing bonds and stocks; individual investment programs. Prerequisite: 262. Antecedents suggested: 374, 474. Fall, Winter. Rec 3 Credit 3.

576. **Investment Analysis.** Class and home practice in analyzing and evaluating the securities of twenty or more corporations; cyclical movements of security prices. Prerequisite: 575 Spring. Rec 2. Credit 2.

580. **Applied Sociology.** Sociological thought and problems. Prerequisite: 233, 386, or equivalent. Spring. Rec 3. Credit 3

585. **Rural Population.** Composition, characteristics, and movements of rural population as compared with urban Prerequisite: 233, 386, or equivalent. Spring Rec. 3. Credit 3.

586. **Rural Leadership.** Specific problems of rural life; selection, development, tasks, obligations, and opportunities of rural leadership. Prerequisite: 233, 386, or equivalent. Spring. Rec. 3. Credit 3

587. **Rural Social Organization.** Place and function of farmer movements and organizations in a changing rural order. Objectives and role of formal and informal organizations in neighborhood, community, and rural-urban groups. Prerequisite: 233, 386, or equivalent. Fall. Rec 3 Credit 3.

588. **Social Legislation and Social Problems.** Analysis of existing, proposed and needed social legislation and study of the methods of attack on social problems Prerequisite: 233, 386, or equivalent. Winter, Spring. Rec. 3. Credit 3.

599. **Special Topics.** Prerequisite· 233 or equivalent, and for Rural Sociology 386. Fall, Winter, Spring. Credit 1 to 5.

A. Agricultural Economics. Messrs. Allbaugh, Hopkins,· Murray, Robotka, Quintus, Schickele, Schultz, Shepherd, Wilcox.

B. Consumption Economics Miss Hoyt, Miss Reid.

C. Industrial Economics. Messrs. Benedict, Fuller, Wright.

D. Rural Sociology. Messrs. Anderson, Von Tungeln, Wakeley.

604. **Money and Banking.** Advanced monetary and banking theory; the foreign exchanges; central banking; the gold standard. Prerequisite: 504. Spring. Credit 3. Mr. Wright.

605, 606. **History of Economic Doctrines.** Fall, Winter. Lect. and rec. 3. Credit 3. Mr. Wright.

631, 632, 633. **Agricultural Marketing.** Fall, Winter, Spring, respectively. Credit 3 each course. Mr. Robotka Mr. Shepherd.

634. **Land Valuation.** Spring. Credit 3. Mr. Murray.

641, 642, 643. **Economics of Production.** Including farm accounting and land economics. Fall, Winter, Spring, respectively. Credit 3 each course. Messrs. Schultz, Schickele.

650. **Seminar.** Staff and graduate student conferences. May be taken for not to exceed three hours' credit in any quarter. Mr. Schultz.

699. **Research in Economics and Sociology.**

A. Farm Management and Organization. Messrs. Allbaugh, Hopkins, Murray.

B. Farm Finance. Mr. Murray.

C. Foreign Trade. Mr. Schultz.

D. Land Economics. Messrs. Schickele, Schultz, Wilcox.

E. Marketing. Messrs. Fuller, Quintus, Robotka, Shepherd.

F. Price Analysis. Mr. Hopkins, Mr. Shepherd.

G. Consumption Economics. Miss Hoyt, Miss Reid.

H. Industrial Production. Mr. Fuller.

I. Industrial and Public Finance . Mr. Benedict, Mr. Wright.

J. Rural Sociology. Messrs. Anderson, Wakeley, Von Tungeln.

ELECTRICAL ENGINEERING

M. S. Coover, Head of Department

Professor Fish; Associate Professor McClain; Assistant Professors Anderson, Brown, Willis; Instructors Hessler, Vaile; Graduate Assistants Boast, Johnson

For information concerning the Division of Engineering, see page 63.

The field of electrical engineering offers real opportunities to young men with trained intelligence. Business and industry are always in need of those who have had the advantage of an education that develops skilful thinking, analytical ability and sound judgment based upon a knowledge of fundamental principles. It is a significant fact that sooner or later approximately seventy percent of engineering graduates find themselves in positions of executive responsibility.

Electrical engineers engage in the management and operation of electrical manufacturing industries, electric power utilities, communication systems, steel mills, railroads, and industrial plants in general. Others establish themselves as research engineers, consulting engineers and valuation engineers. The curriculum in electrical engineering has been designed to enable the individual to enter any of these fields according to his incentive, initiative, and talents.

The first year presents splendid foundation material in chemistry, mathematics, English, drawing, and engineering application problems.

The second year introduces the student to the fundamental laws of the electric and magnetic circuit, which to him is his first real contact with the language of electrical engineering. A good balance is maintained between the electrical courses and those other subjects so necessary to provide adequate training.

The third and the fourth years give the student increasingly more electrical engineering studies both in the classroom and in the laboratories, and at the same time permit considerable freedom for the choice of elective courses. These elective courses may be technical or non-technical in nature, but care should be exercised in choosing them in conference with the counselor to whom the student has been assigned.

The electrical engineering laboratories are classified according to their utilization as introductory, general, transformer, communication, standardization, high voltage, and research laboratories. The equipment in each of these is adequate and modern.

Students appointed to the Reserve Officers' Training Corps will fill three hours elective each quarter with courses in Military Science. For them, in the fall quarter of the senior year, Mil. Sci. will replace Communication, E.E. 487.

Curriculum in Electrical Engineering

For entrance requirements, see page 36.
Leading to the degree of Bachelor of Science.
For professional degree, see page 82.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Project. Draw. Engr. Dr. 132	3	Working Drawings Engr. Dr. 133	3
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1	Military 103 or 123	1
Military 101 or 121	1	Military 102 or 122	1		
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., E.E. 100 (Spring).

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Elect. and Mag. Circuits E.E. 221	3	D.C. Machines E.E. 222	3	D.C. Machines E.E. 223	3
Extempore Speaking P.S. 311	2	Extempore Speaking P.S. 312	2	Electrical Laboratory E.E. 224	2
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Light and Sound Phys. 223	5
Engineering Economics Ec. 261	3	Metal Shop M.E. 233	3	Prop. of Materials T.&A.M. 334	2
Military 201 or 221	1	Military 202 or 222	1	Engineering Problems Gen.E. 206	1
				Military 203 or 223	1
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
A.C. Theory E.E. 331	5	A.C. Theory E.E. 332	4	A.C. Machines E.E. 333	4
Electrical Laboratory E.E. 341	2	Electrical Laboratory E.E. 342	1	Electrical Laboratory E.E. 343	1
Physical Measurements Phys. 311	1	Physical Measurements Phys. 312	1	Physical Measurements Phys. 313	1
Statics of Engineering T.&A.M. 274	3	Mechanics of Materials T.&A.M. 324	5	Dynamics of Engineering T.&A.M. 344	4
Accounting Ec. 374	4	Materials Laboratory T.&A.M. 327	1	Thermodynamics M.E. 344	5
*Electives	3	Metallurgy M.E. 239	3	Electives	3
		Electives	3		
	18		18		18

SENIOR YEAR

A.C. Machinery E.E. 441	4	Vacuum Tube and Control Devices E.E. 442	3	‡Advanced Elect. Engr. E.E. 443	3
Electrical Laboratory E.E. 451	2	Power and Transmission E.E. 445	3	Power and Transmission E.E. 446	3
†Communication E.E. 487	3	Electrical Laboratory E.E. 452	2	Electrical Laboratory E.E. 453	2
Scientific Papers Engl. 414	3	Engineering Contracts Engr. 405	3	Engineering Valuation Engr. 407	3
Power Plant Engineering M.E. 466	6	Power Plant Engineering M.E. 467	4	Electives	7
		*Electives	3		
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, E.E. 471, 472, 473; Inspection Trip, E.E. 400 (Fall).

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year. See paragraph on electives, page 172

†Not required of students appointed to the Reserve Officers' Training Corps.

‡Not required of those who elect 444, 494, or 595.

Description of Courses

100. **Technical Lectures.** The field of electrical engineering, its opportunities and requirements. One lecture per week. Spring. Required.

221. **Electric and Magnetic Circuits.** The laws of electric and magnetic circuits, with especial reference to their application to electrical engineering. Prerequisite: Math. 102 and credit or classification in Phys. 221. Fall, Winter. Rec. 3. Credit 3.

222, 223. **Direct Current Machines.** Characteristics of direct current apparatus and machinery. Prerequisite: 221. Winter, Spring. Rec. 3. Credit 3 each course.

224. **Electrical Laboratory.** Experimental determination of the characteristics of direct current machines. Prerequisite: classification in 223. Spring. Lab. 2, 3 hr. Credit 2.

331, 332. **Alternating Current Theory.** Mathematical and graphical analysis of current and voltage relationships in single and polyphase circuits. Prerequisite: 223, Math. 213. Fall, Winter. Rec. 5, 4, respectively. Credit 5, 4.

333. **Alternating Current Machines.** Principles of design, construction, and operation of alternating current machines. Prerequisite: 332. Spring. Rec. 4. Credit 4.

338. **Direct Current Machines.** Fundamental laws of electric and magnetic circuits. General principles of construction and operation of direct current machines. Prerequisite: Phys. 222, Math. 212, and classification in E.E. 348. Fall. Rec. 3. Credit 3.

339. **Alternating Current Circuits and Machines.** Principles of alternating current circuits and machines. Must be accompanied by 349. Prerequisite: 338. Winter. Rec. 3. Credit 3.

340. **Alternating Current Machines.** Continuation of 339. Must be accompanied by 350. Spring. Rec. 3. Credit 3.

341. **Electrical Laboratory.** Continuation of 224. Prerequisite: 224. Fall. Lab. 2, 3 hr. Credit 2.

342. **Electrical Laboratory.** Alternating current circuits and machines. Prerequisite: 341 and classification in 332. Winter. Lab. 1, 3 hr. Credit 1.

343. **Electrical Laboratory.** Continuation of 342. Prerequisite: 342, and classification in 333. Spring. Lab. 1, 3 hr. Credit 1.

348. **Direct Current Laboratory.** To accompany 338. Fall. Lab. 1, 3 hr. Credit 1.

349. **Electrical Laboratory.** To accompany 339. Winter. Lab. 1, 3 hr. Credit 1.

350. **Alternating Current Laboratory.** To accompany 340. Prerequisite: 349. Spring. Lab. 1, 3 hr. Credit 1.

355. **Electrical Applications in Building.** Circuit requirements in modern buildings and characteristics of the electrical equipment installed. Prerequisite: Arch. E. 383. Fall. Rec. 3. Credit 3.

400. **Senior Inspection Trip.** One week spent in Chicago and other industrial centers. Prerequisite: Senior E.E. classification. Fall. Required.

435. **Direct Current Circuits and Machines.** Prerequisite: Physics 222, and Math. 211. Fall. Rec. 3. Credit 3.

436. **Direct Current Laboratory.** Must be accompanied by 435. Fall. Lab. 1, 3 hr. one week; report writing, 3 hrs. following week. Credit 1.

437. **Alternating Current Circuits and Machines.** Prerequisite: 435. Winter. Rec. 3. Credit 3.

438. **Alternating Current Laboratory.** Prerequisite: 436. Must be accompanied by 437. Winter. Lab. 1, 3 hr. one week; report writing, 3 hrs. following week. Credit 1.

441. **Alternating Current Machines.** Continuation of 333. Fall. Rec. 4. Credit 4.

442. **Vacuum Tube and Control Devices.** Theory, characteristics and engineering applications of vacuum tubes and photo-electric devices. Prerequisite: 332. Winter. Rec. 3. Credit 3.

443. **Advanced Electrical Engineering.** A survey of more advanced electrical engineering practice involving networks, stability, and transients. Prerequisite: 441. Spring. Rec. 3. Credit 3.

444. **Vacuum Tube Engineering.** Mathematical analysis of vacuum tube circuits as used in engineering applications. Prerequisite: 442. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

445, 446. **Power and Transmission.** Electrical equipment of power plants. Design, construction and operation of transmission and distribution systems. Prerequisite: 441. Winter, Spring, respectively. Rec. 2. Lab. 1, 3 hr. Credit 3 each course.

451, 452, 453. **Electrical Laboratory.** Experimental determination of the characteristics of alternating current machines. Prerequisite: 343, and credit or classification in 441. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

471, 472, 473. **Seminar.** Preparation, presentation, and discussion of papers on selected or assigned topics in electrical engineering. Prerequisite: classification in senior electrical engineering studies. Fall, Winter, Spring, respectively. Rec. 1. Required each course.

476. **Electric Railways.** Electric railway systems and apparatus, design of feeder and trolley systems, and determination of proper equipment for specified service. Prerequisite: 441. Spring. Lect. and rec. 3. Credit 3.

487. **Elements of Communication.** The fundamental principles of communication systems. Prerequisite: 332, 339, or 437. Fall. Rec. 3. Credit 3.

488. **Telephone Transmission.** Fundamental principles. Prerequisite: 487. Winter. Rec. 3. Lab. 0 or 1, 3 hr. Credit 3 or 4.

489. **Telephone Transmission.** Application to communication circuits and equipment. Prerequisite: 488. Spring. Rec. 3. Lab. 1, 3 hr. Credit 3 or 4.

490. **Radio Communication.** The fundamental principles of radio communication systems. Prerequisite: 487. Spring. Rec. 3. Lab. 1, 3 hr. Credit 3 or 4.

494. **Elementary Transient Phenomena in Electric Circuits.** Mathematical development of expressions of common voltage and current transients, with experimental check by means of oscillograph. Prerequisite: 441 or equivalent. Spring. Rec. 3. Credit 3.

498. **Thesis.** Students especially qualified and desiring to do so may prepare and submit a thesis. This will consist of an original investigation and a complete report. The subject must be approved by the head of the department, but wide latitude will be given in the choice. Prerequisite: senior classification. Credit 3 to 5.

595. **Special Topics.** Formulation and solution of theoretical or practical problems connected with electrical circuits, apparatus, machines or systems. Fall, Winter, Spring. Credit 2 to 5 each quarter. Mr. Coover.

600. **Seminar.** Fall, Winter. Credit 2 or 3. Mr. Hessler.

614. **Electrical Properties of Solid, Liquid, and Gaseous Dielectrics.** Theory of dielectrics, potential gradient and breakdown potentials, ionization and corona losses. Fall, Spring. Lect., rec., and lab. Credit 3 to 5 each quarter. Mr. Brown.

626. **Transmission and Distribution Engineering.** Design of electric transmission, substation, and distribution systems. Prerequisite: 446. Spring. Lect., rec. and design periods. Credit 3 to 5. Mr. Coover..

628. **Power System Stability.** Three and four-circuit transformers, solution of unbalanced circuits by the method of symmetrical components, use of charts representing transmission lines and synchronous machines in the electrical steady state for the determination of system stability limits. Spring. Lect., rec., and lab. Credit 3 to 5. Mr. Anderson.

636. **Transient Phenomena.** Study of transient effects in the operation of electric machines and systems. Prerequisite: 646, 650. Winter. Lect., rec., and lab. Credit 3 to 5. Mr. Brown.

637. **Transmission-Line Transients.** Traveling waves on single-circuit lines including a study of attenuation, distortion, and reflection; oscillations in transformer windings; outline of methods for multi-circuit lines. Prerequisite: 646. Winter, Spring. Lect., rec., and lab. Credit 3 to 5. Mr. Anderson.

646. **Circuit Analysis by Operational Methods.** Fundamental means of solving circuit problems, including the classic method, the superposition theorem, the Heaviside expansion theorem, the Heaviside operational calculus, and the Fourier integral. Prerequisite: 441 or equivalent. Fall. Credit 3 to 5. Mr. Anderson.

647. **Telephonic Communication Circuits.** Methods of analysis and design of transmission circuits for telephonic communication. Prerequisite: 489, or equivalent. Rec. 3. Lab. 1, 3 hr. Credit 4. Mr. Anderson.

650. **Advanced Alternating Current Machines.** An extended mathematical study of the theory of alternating current machinery and of the application of the theory to practical performance. Prerequisite: 441 or equivalent. Fall. Credit 3 to 5. Mr. Fish.

654. **Advanced Technical Problems.** Graphical, numerical, and analytical methods of solving differential equations applied to problems representative of those likely to be met by a consulting engineer. Fall, Winter, Spring. Credit 3 to 5 each time elected. Mr. Vaile.

656. **Research.** Mr. Coover.

ENGINEERING

ANSON MARSTON, Head of Department

For information concerning the Division of Engineering, see page 63.

A certain number of general courses, listed below, are given by the Dean of the Engineering Division and by other members of the engineering faculty for the service of the entire division.

A certain amount of Engineering Economics is required in each of the several engineering curricula, and in addition engineering students who desire can elect more advanced work from the Engineering Economics courses listed below.

For the student who desires a full four-year curriculum which combines the fundamental principles of engineering with the principles of business administration, see page 185 for the outlined curriculum in General Engineering.

In each of the curricula in engineering there is provision for elective subjects during the junior and senior years. It is recommended that part of the electives be selected with a view to broadening the knowledge in some field other than those directly related to engineering.

Description of Courses

114. **Orientation.** The nature of professional work in engineering. Methods of testing the individual's aptitudes for the engineering profession. Fall. Lect. 1. Required.

115. **Orientation.** The nature of the various branches of engineering and some fundamental considerations in selecting a career. Winter. Lect. 1. Required.

354. **Employment Methods and Employee Development.** Principles and technique of employment methods and their relation to industrial development. Prerequisite: senior college classification. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

405. **Engineering Contracts.** The engineer in business; contract essentials and principles; agent and independent contractor; contracts involving real and personal property, sale and transportation; corporation engineering; legal and equitable jurisprudence. Prerequisite: senior college or graduate college classification. Fall, Winter, Spring. Rec. 3. Credit 3.

406. **Alignment Charts for Engineering Formulae.** Construction of conversion scales, alignment charts and similar devices for solving various engineering equations. Prerequisite: Math. 213. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

407. **Engineering Valuation.** The principles of valuation work by engineering experts. Prerequisite: senior college or graduate college classification. Fall, Winter, Spring. Rec. 3. Credit 3.

416. **Graphical Analysis of Engineering Problems.** Studies of graphical methods of solving various experimental problems arising in engineering practice. Prerequisite: Math. 213. Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

417. **Engineering Valuation.** The application of the principles of engineering valuation including field work; collection and use of mortality data; study of court practices regarding the valuation of utilities. Prerequisite: 407. Fall, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

425. **Principles of Personnel Supervision.** Discussion of a series of cases of the general variety of human contacts which arise in the course of employment, with the desirable methods to meet such conditions when they occur. Prerequisite: senior classification in engineering. Spring. Rec. 3. Credit 3.

604. **Engineering Valuation Research.** Mr. Marston.

605. **Engineering Law.** Engineering relations; professional ethics; evidence; expert witness; contract letting, advertisement, instructions, proposal, contract forms; workmen's compensation, and employer's liability laws; mechanic's and material man's liens. Prerequisite: 405. Fall, Winter, Spring. Rec. and lab. 3 to 5. Credit 3 to 5. Mr. Meeker.

606. **Engineering Education Research.** Mr. Marston.

ENGINEERING ECONOMICS

261, 262, 263. **Principles and Problems of Economics.** Not open to freshmen. (261) Fall, Winter, Spring. (262) Winter, Spring. (263) Spring. Rec. 3. Credit 3 each course

365. **Business Law.** Fundamental principles of law as applied to business transaction. Fall, Winter, Spring. Rec. 3. Credit 3.

366. **Advanced Business Law.** Continuation of 365. Emphasis on credit transaction, employment relations, non-contractual rights and liabilities. Prerequisite: 365. Winter. Rec. 3. Credit 3.

370. **Elementary Accounting.** Fundamental accounting principles common to all business enterprises. Winter, Spring. Rec. 2. Lab. 1 or 2, 3 hr. Credit 3 or 4.

374. **Accounting.** Preparation and analysis of balance sheet and profit and loss statement. Double entry bookkeeping, significance of assets, liabilities, expenses, and incomes. Prerequisite: 261 or equivalent and senior college classification. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

375. **Advanced Accounting.** Analysis of financial statements, applications of accounting methods as an instrument of business control. Prerequisite: 370 or 374. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

376. **Cost Accounting.** Methods of determining and analyzing costs of materials; processes of labor and machines; distribution of direct and overhead costs; preparation of cost reports. Prerequisite: 370 or 374. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

406. **Industrial Relations.** Relations of employer and employee under present conditions of industry. Matters of public policy such as labor legislation and social insurance. Prerequisite: 202 or equivalent. Winter. Rec. 3. Credit 3.

499C. **Special Problems in Industrial Economics.** Prerequisite: 203 or equivalent. As arranged. Fall, Winter, Spring. Credit 1 to 5.

560. **Economics of Public Utilities.** To acquaint the student with the development, economic characteristics, and management of public utilities. Prerequisite: 203 or equivalent, 374. Spring. Rec. 3. Credit 3.

564. **Corporate Organization.** Organization and control of corporations and other forms of business. Procedure of incorporation, relationships of the parties in the corporation, and combinations of corporations in large industries and utilities. Prerequisite: 261 or equivalent, 365, 374. Spring. Rec. 3. Credit 3.

568. **Industrial Marketing.** From the standpoint of the manufacturer. Merchandising channels, sales organization, sales engineering, and co-ordination of sales and production. Prerequisite: 263, 374. Winter. Rec. 3 or 5. Credit 3 or 5.

575. **Investments.** Security prices and yields; essential investment features of various corporate securities—risk, income, control, etc.; method of testing bonds and stocks; individual investment programs. Prerequisite: 262. Antecedents suggested: 374, 474. Fall, Winter. Rec. 3. Credit 3.

576. **Investment Analysis.** Class and home practice in analyzing and evaluating the securities of twenty or more corporations; cyclical movements of security prices. Prerequisite: 575. Spring. Rec. 2. Credit 2.

599C. **Special Topics in Industrial Economics.** Messrs. Benedict, Fuller, Wright.

699. **Research.**

E. Marketing. Messrs. Fuller, Quintus, Robotka, Shepherd.

H. Industrial Production. Mr. Fuller.

I. Industrial and Public Finance. Mr. Benedict, Mr. Wright.

ENGINEERING DRAWING

O. A. Olson, Acting Head of Department

Assistant Professor F. C. Miller; Instructors Berkel, H. J. Miller, Stevens

For information concerning the Division of Engineering, see page 63.

Drawing is one of the oldest of all languages. In the Louvre, Paris, a statue of Gudea, the engineer-ruler, bears a description and drawing of a temple that was constructed about 2600 B.C. In spite of its early use among many nations, drawing is not a "dead" language. Refinement in its international use is a daily study among teachers, draftsmen, engineers, and authors of engineering books.

In the present industrial age, nearly all readers of papers, magazines, and scientific reports are compelled to interpret drawings as a part of the composition. Due to this fact, it would be an aid to all classes of people to have a reading knowledge of the engineer's language.

Engineering Drawing is a graphical means of conveying and recording directions for the construction of material objects in such a way that the information is definite, accurate, and readily understood by those who use it.

As an educational subject, the study of Engineering Drawing develops accurate thinking, strengthens the faculties of visualization, and develops neatness and legibility in graphical expression. The student is given a vehicle of expressing new ideas or inventions without excessive cost. For the freshman, few other courses require as much independent thought and action.

Engineers do not think of Engineering Drawing as a profession. Nevertheless, many find it a gateway through which they pass in entering the engineer's field.

The Department of Engineering Drawing is a service department. Freshmen from all the engineering departments have a common course under teachers selected from the various departments.

It is the policy of the Department of Engineering Drawing to teach the fundamentals of the "grammar" of Engineering Drawing. Emphasis is placed on straight thinking, visualization, accuracy, neatness, and

speed in workmanship; development of theoretical knowledge, and the making of complete working drawings such as are used in commercial work.

Description of Courses

131. **Drawing and Projection.** Use of instruments, lettering, orthographic and isometric projections, curves, charts, and graphs. Fall, Winter, Spring. Lab. 2, 3 hr. Credit 2.

132. **Theory of Projective Drawing (Descriptive Geometry).** Practical applications. Prerequisite: 131. Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

133. **Working Drawings.** Technical sketching, dimensioning, standards and conventions, detail and assembly drawing of machines, structures, and conduits. Prerequisite: 132. Fall, Winter, Spring. Lab. 2 or 3, 3 hr. Credit 2 or 3.

ENGLISH

J. R. DERBY, Head of Department

Professors Jones, Noble, Raymond; Associate Professors Cooper, Hogrefe, Lange, Lorch, Starbuck, Tompkins; Assistant Professors Dudley, Fuller; Instructors Fleming, Foladare, Hauer, Kirkman, MacArthur, Mathis, Safford, Shultz, Walker, Wallace

For information concerning the Division of Industrial Science, see page 69.

The Department of English undertakes to provide for technical students courses in both composition and literature.

Required Freshman Composition, with constant practice in writing, includes a review of fundamental grammar and sentence structure, the student's analysis and consequent improvement of his own style, and a brief introduction to the ideas of Greek, Hebrew, and English literature. Through composition a student has the opportunity to understand himself and his environment, to organize expository and informational papers, to think critically of reading and writing as parts of the same process, and to interpret human values through his own experience.

Ambitious students who wish to maintain skill, to rise above mere accuracy, and to gain power and individuality of expression, elect further courses in writing, choosing 204, 205, 304-305, or 404.

In literature the student is offered a carefully selected list of courses with emphasis on ideas and on appreciation. Through a liberal approach to ideas he has a chance to form reading habits, to develop independence and originality in thinking, to realize social obligations, and to appreciate such non-material values as beauty and truth—in brief, to develop a culture which is a vital part of well-balanced living. He may choose such basic courses as 254, 255, if they are elective in his curriculum; he may add 354, 355, 364, 374, 454, 455, 456, 464, 466, 467.

Description of Courses*

101, 102, 103. **Freshman Composition.** (101) Fundamental principles. Sentence, paragraph, short papers, précis-writing. (102) Exposition. Short and long papers. (103) Literary types related to composition. Short and long papers. Fall, Winter, Spring. Rec. 3. Credit 3 each course.

*For description of vocational courses, see page 291.

104. **Composition.** For students who come from other colleges and bring partial credit in required composition, or who for other reasons need to supplement this requirement. Winter, Spring. Rec. 2. Credit 2.

204. **Expository Writing.** Reading of essays and a current periodical as a basis for discussion and writing. Prerequisite: 103, Lib. 106. Fall, Winter, Spring. Rec. 2. Credit 2.

205. **Reasoning and Writing.** Basic principles. Gathering and evaluating evidence; reasoning; detecting fallacies; analyzing persuasive elements in magazine articles, editorials, advertisements, etc. Short and long papers. Prerequisite: 103, Lib. 106. Fall, Winter, Spring. Rec. 3. Credit 3.

254, 255. **Nineteenth Century.** British masterpieces of the nineteenth century and their relation to scientific thought and to the tendencies of the present day. Prerequisite: 103. (254) 1798 to 1832. Fall, Winter, Spring. (255) 1832 to 1890. Winter, Spring. Rec. 3. Credit 3 each course.

304, 305. **Advanced Composition.** For students who already write with some skill. Prerequisite: 103. (304) Writing adapted to the needs and interests of the individual student. (305) Stress upon a single type of writing selected by the individual student. Fall, Winter, Spring. Rec. 3. Credit 3 each course.

354, 355. **World Literature.** Prerequisite: 103. (354) Representative masterpieces of Greek, Roman, Italian, German, and Russian literatures. Spring. (355) Survey of man's attitude toward nature. Not offered in 1936-37. Winter. Rec. 3. Credit 3 each course.

364. **American Masterpieces.** Reading course in nineteenth-century American poetry and prose, with particular attention to the recognized masterpieces. Prerequisite: 103. Winter, Spring. Rec. 3. Credit 3.

374. **British Masterpieces.** Prior to 1775. Significant works of the great English writers prior to the Romantic era. Prerequisite: 103. Spring. Rec. 3. Credit 3.

394. **The Teaching of English.** (Voc. Ed. 394.) For students preparing to teach English in addition to other subjects. The teaching of literature and composition. Prerequisite: a quality-point average of 2.5 in twelve hours, including 205 or 304 *and* nine hours selected from 254, 255, 364, 374, 454, 464. Spring. Rec. 3. Credit 3.

404. **Business Correspondence.** Open to senior-college students only. Principles which govern the writing of business letters. Types of business letters. Winter, Spring. Rec. 2. Credit 2.

414. **Writing of Scientific Papers.** For juniors and seniors in any technical department wishing to co-operate. Projects in technical exposition. Required and collateral readings. Prerequisite: 103. Fall, Winter, Spring. Rec. 3. Credit 3.

454, 455, 456. **Fiction.** Prerequisite: 103. (454) The short story. Its growth as a distinct literary type with emphasis upon the modern period. Spring. (455) Representative novels by Jane Austen, Scott, Dickens, Thackeray, and George Eliot. Winter. (456) Representative novels by Meredith, Hardy, Henry James, Conrad, and Galsworthy. Not offered in 1936-37. Spring. Rec. 3. Credit 3 each course.

464, 466, 467. **Drama.** Prerequisite: 103. (464) Shakespeare. Rapid reading of histories, comedies, and tragedies for intelligent appreciation. Fall, Spring. (466) Recent British and American drama. Representative plays illustrating the principal tendencies of the stage since 1860; appreciation of the drama as a literary type. Not offered in 1936-37. Winter. (467) Modern Continental drama. Ibsen, Maeterlinck, Hauptmann, Chekhov, and Rostand; study of innovations in technique and theme. Winter. Rec. 3. Credit 3 each course.

FARM CROPS

(Sub-Department of Agronomy)

For description of courses, see page 119.

FLORICULTURE

See page 218.

FORESTRY

(Administered in the department of Horticulture and Forestry. See page 215.

B. S. PICKETT, Head of Department

PROFESSOR G. B. MACDONALD
Associate Professors Genaux, Thomson; Assistant Professors Hartman, Larsen; Instructor McComb; Extension Worker Ramsey

For information concerning the Division of Agriculture, see page 58.

CURRICULA OFFERED. The department offers a four-year undergraduate curriculum in Forestry, permitting the student to specialize either in Forest Management or Lumber Marketing. During the junior and senior years students who are especially interested in closely allied lines may take certain optional subjects in botany, zoology, economics, animal husbandry, soils and other lines, in order to better prepare themselves for more specialized federal and state work in wildlife management, range management, and forest economics.

OPPORTUNITIES FOR FORESTERS. The rapid development of forestry in the past few years has created an increasing demand for trained foresters. Although forestry is a comparatively new profession in this country, positions for trained men are now open in a number of lines covering a wide field of activity. Positions are now open in state and national forestry work; with lumber companies, railroads, and other corporations. The development of forestry on private timberlands during the next few years will require the services of many additional technically trained men.

SUMMER CAMP. In addition to the laboratory and field work at the College, the students are required to spend ten weeks in summer camp in some good forest region of the country. The entire time is spent in field operations, consisting of estimating timber, mapping the forest types, making volume tables, and the studying of logging and milling operations. The general equipment for the camp, such as tents and field instruments, is furnished by the College; the student is required to furnish bedding and personal effects. These camps, during the past few years, have been established in some of the best stands of timber in the country located in Minnesota, Colorado, California, Oregon, Washington, Idaho, Montana, North Carolina, and Michigan.

ENROLLMENT. The present facilities of the college make it necessary to limit the second year enrollment for the college year 1936-37 to seventy-five students. If more than this number apply the faculty will select those students who in its judgment are best qualified, based on personal conferences with members of the forestry faculty or some person designated by the college. In each case the high school record, scholastic performance in college, evidence of good character, satisfactory personality, and other factors will be taken into consideration in limiting the enrollment, in the event that such curtailment is necessary. All things being equal, residents of Iowa will be given preference.

Curriculum in Forestry

Leading to the degree of Bachelor of Science.

Forestry students are required to complete three months of practical forestry work before graduation in addition to the summer camp.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Forestry For. 101[1]	8	General Forestry For. 102	2	General Forestry For. 103	8
General Botany Bot. 101	3	General Botany Bot. 102	3	Systematic Botany Bot. 206	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	Surveying C.E. 116	3
		Forest Zoology Zool. 124	4	Agricultural Geology Geol. 375	3
Military 121	1	Military 122	1	Military 123	1
	15		18		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Seminar, For. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104 (three months of which is to be forestry summer camp), see page 117.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SUMMER CAMP

The following courses of study are carried on in the summer camp for forestry students. The camp curriculum occupies ten weeks during the summer between the Freshman and Sophomore years. Summer camp is prerequisite for entrance to the Junior year.

Silviculture For. 214	5
Lumbering For. 234	4
Natl. For. Operations For. 250	4
Forest Mensuration For. 244	5
	18

SOPHOMORE YEAR

Lumbering For. 224	5	Forest Mensuration For. 241	4	Forest Mensuration For. 242	2
Forest Mapping For. 245	3	Tech. Journalism T.Jl. 225	3	Forest Planting For. 206	5
Dendrology Bot. 256	4	Dendrology Bot. 257	3	Organic Chemistry Chem. 257	4
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	American Government Govt. 214	3
		Physics Phys. 204	3	Soils Soils 254	3
Military 221	1	Military 222	1	Military 223	1
	17		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; and For. 211, 212, 213.

JUNIOR YEAR

Students who desire to supplement the regular forestry work with additional courses in economics should take Ec. 232, in the Winter quarter in place of For. 385, and Ec. 233 in the Spring in place of For. 396.

Students who are especially interested in wildlife should take Animal Biology, Zool. 111, 4 credits; Zool. 112, 4 credits; and Zool. 113, 4 credits, in place of Zool. 504, For. 385, and Zool. 506.

Students intending to prepare for range work on National or other public areas should take Animal Biology, Zool. 111, 4 credits; Zool. 112, 4 credits; and Zool. 113, 4 credits, in place of Zool. 504, For. 388, and Zool. 506.

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
General Ecology Bot. 424	3	Silviculture For. 301	3	Silviculture For. 302	3
†Game Animals Zool. 504	3	Wood Technology For. 388	4	For. Admin. & Protection For. 397	3
Surveying C.E. 311	4	Surveying C.E. 312	4	Surveying C.E. 313	3
Gen. Agr. Economics Ec. 231	3	Timber Preservation For. 385	3	Forest Finance For. 396	4
Forest Soils Soils 374	3	†Plant Physiology Bot. 205	4	Chem. For. Products Chem. 259	2
				†Fishes Zool. 506	3
	16		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 311, 312, 313.

SENIOR YEAR*

Students desiring to emphasize economics work are advised to take the following in the Senior year: Fall: For. 303, 494, Zool. 377; Ec. 234; Winter: For. 399, 487, Ec. 370, Bot. 416; Spring: For. 470, P.S. 311, Ec. 375, 386.

Students desiring to emphasize the wildlife work in the forestry curriculum should take the following in the Senior year: Fall: For. 303, 343, A.H. 101, Zool. 377, 504; Winter: For. 385, 399, A.H. 102, Gen. 300, Zool. 520; Spring: T.Jl. 335, P.S. 311, Zool. 315, 506.

Students preparing for range administration work on national forests or other public areas should take the following in the Senior year: Fall: For. 303, 398, A.H. 101, Zool. 377, 504; Winter: For. 399, 495, A.H. 102, Bot. 455, Gen. 300; Spring: For. 470, 496, Bact. 304C, Zool. 506.

Forest Management Group

Forest Management For. 494	4	Forest Products For. 487	5	Gen. Forest Economics For. 470	3
Silviculture For. 303	3	History and Policy For. 399	4	Extempore Speaking P.S. 311	3
Forest Mensuration For. 343	3	Plant Pathology Bot. 416	4	Rec. & Regional Planning L.A. 403	3
Forest Insects Zool. 377	3	Electives	5	General Bacteriology Bact. 304C	4
Electives	5			Feature Articles T.Jl. 335	3
				Electives	2
	18		18		18

Lumber Marketing Group

Forest Management For. 494	4	Forest Products For. 487	5	Gen. Forest Economics For. 470	3
Silviculture For. 303	3	History and Policy For. 399	4	General Bacteriology Bact. 304C	4
Forest Mensuration For. 343	3	Lumber Markets For. 438	4	Extempore Speaking P.S. 311	3
Forest Insects Zool. 377	3	†Plant Pathology Bot. 416	4	Feature Articles T.Jl. 335	3
Electives	5			Electives	5
	18		17		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, For. 411, 412, 413.

†May be omitted until the Senior year by students appointed to the Reserve Officers' Training Corps.

*The student should choose either the Forest Management or the Lumber Marketing Group at the beginning of the Senior year. Those who expect to go into research work in forestry are advised to take at least a year of a foreign language, preferably German.

Students who desire to supplement their regular forestry course with additional work in lines closely related to forestry are urged to complete work as listed below. These groups will provide a good basis for later graduate work in the various fields

Forest Economics. Fall: For. 343, Ec 304, 334, L.A. 404; Winter: For. 385, 438, Ec. 365, 507, Hist. 324; Spring: Ec. 508. Engl. 404, L.A. 403, T.Jl. 335 A, For. 396.

Forestry and Conservation. Fall: For. 398, L.A. 404, Ec. 386, Soils 454; Winter: For, 438, Psych, 204, A. E. 422, Zool. 520; Spring: For. 506, A.E. 428. Soils 464.

Forest and Wildlife Management. Fall· For. 398, 494, Zool. 514, 534; Winter: For. 487, A.H. 350, Zool. 519; Spring: For. 470, Bact. 304C, Engl. 414, Zool. 510

Forest Range Management and Administration. Fall· For. 494, Bot. 584, Bot. 566, L.A. 404; Winter: Bot. 416, T.Jl. 335, Zool. 514; Spring: F.C. 404, P S. 311, Soils 464, Zool. 510.

Description of Courses

100. **Farm Forestry.** Identification and uses of trees and commercial woods; forest planting; woodlot management; shelterbelt installation and fence post treatment. Fall, Winter, Spring. Rec 3. Credit 3.

101, 102, 103. **General Forestry.** A general survey of the field. (101) Fall Lect. and rec. 2. Rec and lab. 1, 3 hr. Credit 3. (102) Winter. Lect. 2. Credit 2 (103) Spring. Lab. 3, 3 hr. Credit 3.

110. **Forestry Seminar.** Current forestry topics. Spring. Lect. 1. Required.

200. **Forest Conservation.** The status of forestry in the United States. A general survey of private, state and federal forestry with reference to the needs of the country. Not open to Forestry students. Winter. Rec. and lectures 3 Credit 3.

206. **Forest Planting.** Collecting and storing tree seeds. Nursery practice, including seed bed methods, transplanting, and field planting. Spring. Lecture and rec. 2. Lab. 3, 3 hr. Credit 5.

211, 212, 213. **Forestry Seminar.** Current forestry topics. Required.

214. **Silviculture.** Field studies of forest stands; types, zonations and formations; harvesting and regenerating the mature crops, improving the young stands; forest ecology. Summer camp. Field work 5, 3 hr. Credit 5.

224. **Lumbering.** Detailed study of logging and milling operations. Fall. Rec and lect. 5. Credit 5.

234. **Lumbering.** A detailed study of logging and milling operations in an important forest region. Summer forestry camp. Field work 4, 3 hr. periods Credit 4

241, 242. **Forest Mensuration.** (241) Measuring the forest and forest products including log scaling and timber estimating. Winter. Rec. and lect. 2. Lab. 2, 3 hr. Credit 4. (242) Continuation of 241, elementary consideration of forest growth Spring. Rec. and lect. 1. Lab. 1, 3 hr. Credit 2.

244. **Forest Mensuration.** Field practice in scaling logs, estimating timber, and preparing various forest maps. Summer camp. Field work 5, 3 hr. periods. Credit 5.

245. **Forest Mapping.** Actual construction of topographic and type maps from field data. Prerequisite· 103. Fall. Lab. and field 3, 3 hr. Credit 3.

250. **National Forest Operations.** A study of the field activities on National Forests. Summer Forestry Camp. Credit 4.

301, 302, 303. **Silviculture.** (301) Factors determining form and growth of trees, distribution of forest types and formations; forest influences. Winter. (302) Development of forest stands as to composition and age classes; application of scientific systems of harvesting and reproducing the forest crops; improvement of immature forests. Spring. (303) The practice of silviculture in the United States and abroad. Fall. Lect. and rec. 3. Credit 3 each course.

311, 312, 313. **Forestry Seminar.** Current Forestry topics. Required.

343. **Forest Mensuration.** Advanced forest measurements, the determination of standards for growth and yield measurement in forests. Fall. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

385. **Timber Preservation.** Seasoning and durability of woods. Kiln drying Methods of preserving railroad ties, timbers, paving blocks, poles, and posts Winter. Lectures 3. Credit 3.

388. **Wood Technology.** Structural, physical, and mechanical properties of commercial woods; their identification and chief uses. Winter. Rec. 1. Lab. 3, 3 hr. Credit 4.

396. **Forest Finance.** (Ec. 396.) Appraisal of forest land and stumpage. Determination of the profit of forests compared with other land uses. Land classification, forest taxation, and credit. Prerequisite: Ec. 231. Spring. Rec. 4. Credit 4.

397. **Forest Administration and Protection.** Organization of national forests. Construction of permanent improvements. Grazing, reforestation, timber sales, etc. Fire protection. Spring. Lect. and rec. 3. Credit 3.

398. **Forest Range Management.** History of the National Forest Range, types of forage, poisonous plant control; range regeneration, grazing, reconnaissance, grazing policies and range management plans. Fall. Lect. and rec. 3. Credit 3.

399. **History and Policy.** Development in the different countries from the earliest periods to the present. State and national law. Municipal forestry. Winter. Rec. 4. Credit 4.

411, 412, 413. **Forestry Seminar.** Current forestry topics. Required.

438. **Lumber Markets.** (Ec. 438.) Economics of the timber industry. Wholesaling and retailing. Exports and imports of lumber and other forest products; prices: lumbermen's associations; freight rates, etc. Prerequisite: Ec. 231. Winter. Lect. and rec. 4. Credit 4.

440. **Special Problems.** Original investigations in advanced technical work, the subject to be chosen after consultation with the Forestry faculty. Fall, Winter, Spring. Credit 2 to 6 each quarter.

470. **General Forestry Economics.** (Ec. 470.) Elementary application of economics to forestry. Production, distribution, and consumption of forest products. Production management of forests. Prerequisite: Ec. 231. Spring. Rec. 3, credit 3.

487. **Forest Products.** Production of paper pulp, veneer, ties, lath, shingles, tanbark, naval stores, etc. Wood distillation. Winter. Rec. and lect. 5. Credit 5.

488. **Commercial Woods.** For Engineering students. Seasoning and kiln drying; defects and grading; characteristics and identification of timbers; preservation of timbers, poles, ties, etc. Winter. Lectures and rec. 2. Lab. 1, 3 hr. Credit 3.

494. **Forest Management.** Regulation for a sustained yield. Working plans for national, private, and European forests. Present practice of forestry. Fall. Rec. 4. Credit 4.

495. **Forest Range Administration.** The management and administration of the range on National and State forests and other public areas. Prerequisite: 398. Winter. Lect. and rec. 3. Credit 3.

496. **Forest Range Management Plans.** The preparation of detailed range management plans for the different National Forest regions of the country. Prerequisite: 398, 495. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

506. **Advanced Forest Planting.** Reforestation on eroded lands. Gully planting. Results of experimental work. State, federal, and private activities. Spring. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

600. **Research.** Mr. MacDonald. Mr. Thomson.

604. **Advanced Silviculture.** Research methods in silviculture. Studies in silvicultural practice in given regions and under special conditions of marketing, land use, climatic, edaphic, and biotic conditions. Prerequisite: 303; Bot. 205. Fall. Credit 2 to 5. Mr. MacDonald.

606. **Advanced Planting.** Detailed studies of forest nurseries. Special problems in timber planting and reforestation work. Lect. and readings. Prerequisite: 206. Spring. Credit 2 to 5. Mr. MacDonald.

634. **Advanced Lumbering.** Special investigations and reports on logging, milling, transportation, and marketing forest products. Conference and special assignments. Prerequisite: 224. Fall. Credit 2 to 5. Mr. MacDonald.

688, 689. **Forest Industries.** Industries depending on forest products, including paper and pulp, veneer, cooperage, turpentine, wood distillation. Prerequisite: 487. Winter, Spring, respectively. Lectures and assignments. Credit 2 to 5 each quarter. Mr. MacDonald.

694. **Advanced Forest Management.** Special problems in the regulation of yield in the forest. Study of working plans. Prerequisite: 494. Fall. Conference, readings, and laboratory. Credit 2 to 5. Mr. Thomson.

697. **Advanced Forest Protection.** Injuries to forests, especially by fire. Study of detailed fire plans. Timber protective associations and their work. Conferences and readings. Prerequisite: 397. Winter. Credit 2 to 5. Mr. Thomson.

Dendrology. Botany 256, 257. See page 135.

Surveying. C.E. 116, 311, 312, 313. See page 157.

Forest Insects. Zool. 377. See page 283.

Plant Pathology. Bot. 416. See page 135.

Chemistry of Forest Products. Chem. 259. See page 150

Forest Soils. Soils 374. See page 120.

GENERAL ENGINEERING

FRANK D. PAINE, Head of Department

Professor Dana; Assistant Professor Hempstead; Instructors Stiles, Van Winkle

For information concerning the Division of Engineering, see page 63.

The curriculum in General Engineering is intended for students who have an interest in business or management and who also have aptitudes in engineering and plan to train themselves for some phase of business operations with technical enterprises. It combines the basic technical training courses in science and engineering with courses in industrial and business management. It develops the facilities to analyze and solve the problems of the business departments of industry; it provides the fundamental training for factory management or production, and for commercial work in sales or application of equipment. It prepares the student to enter the fields of valuation and statistics in federal or state positions, with investment concerns, or insurance companies.

In addition to the fundamental engineering, courses in electricity, mechanics, surveying, structures and power measurements, engineering courses in valuations, contracts, scientific management, employment methods and personnel supervision are included. These are supplemented by courses in business management, accounting, industrial marketing, corporate finance, money and banking, industrial relations, business law, economics of utilities, investments and industrial and sales psychology.

Opportunity is given in the last two years of this curriculum to elect majors in some one branch of engineering, technical journalism or engineering economics. It is possible for the student to elect minors in general subjects or in certain other departments of the College.

The department also offers a group of courses, three of which are required of all engineers, known as Engineering Problems. The instruction supplements that of certain mathematic courses by showing the practical application of various mathematical principles. Students are also trained to produce neat, clear, systematic computation sheets which will meet a typical set of specifications.

Curriculum in General Engineering

Leading to the degree of Bachelor of Science.

For professional degree, see page 82.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Plane Analytic Geometry Math. 103	5
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Drawing and Projection Engr. Dr. 131	2	Theory of Project. Draw. Engr. Dr. 132	3	Industrial History Hist. 235	3
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1		
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., Gen.E. 100 (Spring).

SOPHOMORE YEAR

Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Sound and Light Phys. 223	5
Engineering Economics Ec 261	3	Engineering Economics Ec. 262	3	Business Management Ec. 263	3
Working Drawings Engr. Dr. 133	2	Properties of Materials T.&A.M. 334	2	Statics of Engineering T.&A.M. 274	3
General Psychology Psych. 204	3	Extempore Speaking P.S. 311	2	Engineering Problems Gen.E. 206	1
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, Gen.E. 213 (Spring).

Required Summer Course[4]

Mechanical Engineering 233 or General Engineering 325. Credit 3.

JUNIOR YEAR[6]

Dynamics of Engineering T.&A.M. 344	4	Mechanics of Materials T.&A.M. 324	5	Hydraulics T.&A.M. 378	4
D.C. Machines E.E. 338	3	A.C. Circuits & Machines E.E. 339	3	A.C. Machines E.E. 340	3
D.C. Laboratory E.E. 348	1	Elect. Laboratory E.E. 349	1	A.C. Laboratory E.E. 350	1
Accounting Ec. 374	4	Cost Accounting Ec. 376	4	Money and Banking Ec. 304	3
Employment Meth. and Employee Development Gen.E. 354	3	Business Correspondence Engl. 404	2	Materials Laboratory T.&A.M. 327	1
				Power Measurements M.E. 354	1
				Time Studies M.E. 455	2
*Electives	3	Electives	3	Electives	3
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Gen.E. 311, 312, 313.

*Appreciation of Art, C.C. 401, 402 403, total credit 1, must be included in the electives of the Junior or Senior year.

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

[4]Civil Engineering 300, summer camp, may be substituted for the shop work provided the student has credit in the required prerequisites.

[6]Before classification at the beginning of the Junior year, each student must choose a definite course of study to be followed during the Junior and Senior years. The electives may be chosen from any of the Engineering Departments, from the Department of Engineering Economics, the Department of Technical Journalism, or other Departments in the Division of Industrial Science. This course of study must have the approval of the head of the department.

SENIOR YEAR[7]

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Industrial Relations Ec. 406	3	Industrial Marketing Ec. 568	5	Personnel Supervision Gen.E. 425	3
Corporate Finance Ec. 474	3	Industrial Engineering M E. 486	3	Engineering Contracts Engr. 405	3
Engineering Valuation Engr. 407	3	Elements of Structures C.E. 335	5	Writing, Scientific Papers Engl. 414	3
Surveying C.E. 325	3	*Electives	5	Extempore Speaking P.S. 312	3
Industrial Organization M.E. 484	3			*Electives	6
*Electives	3				
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, Gen.E. 411, 412 (Fall, Winter).

[7]Courses in the Junior year not required as prerequisite to courses taken in the Senior year may be shifted to the Senior year.

*One credit may be chosen from: Music 144 (1). For full information concerning the Reserve Officers' Training Corps, see page 244.

Description of Courses

100. **Technical Lectures.** Lectures and conferences designed to aid the freshman student in adjusting himself both in his course and in college environments. Spring. Lect. 1. Required.

104. **Engineering Problems.** Computation forms and methods, training in recording engineering computations in a clear and systematic manner. Fundamentals of the slide rule Practical applications of algebra and arithmetic to problems in engineering, supplementing the instruction in Math. 101. Prerequisite: credit or classification in Math. 101. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1

105. **Engineering Problems.** Practical problems based upon engineering applications of plane trigonometry, supplementing instruction in Math 102C. Further training in organization of computations, computation forms and methods. Prerequisite: Credit or classification in Math 102C. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

204. **Engineering Problems.** Primarily for students who enter with advanced standing, and who are not required to take Gen. E. 104 and 105. The course is intended to familiarize these students with the slide rule, and to train them to record their work in clear, systematic form. Elementary problems in quantity surveying and estimating. Prerequisite: Math. 102C. Fall, Winter. Lab. 1, 3 hr. Credit 1.

206. **Engineering Problems.** Practical problems based upon some of the engineering applications of the calculus. Supplementing the instruction in Math 213, and co-operating with mechanics. Problems dealing with centroids and second moments, graphic and semi-graphic methods of integration and differentiation. Prerequisite: credit or classification in Math. 213. Fall, Winter, Spring Lab. 1, 3 hr. Credit 1.

213. **Seminar.** Required of all Sophomore students. Spring.

311, 312, 313. **Seminar.** Fall, Winter, Spring, respectively. Rec. 1. Required each course.

325, 326. **Summer Work.** Approved summer work in an industrial plant. Credit 3 each course.

354. **Employment Methods and Employee Development.** The principles and technique of employment methods and their relation to industrial development. Prerequisite: senior college classification. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

406. **Alignment Charts for Engineering Formulae.** Construction of conversion scales, alignment charts and similar devices for solving various engineering equations. Prerequisite: Math. 213 Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

411, 412. **Seminar.** Fall, Winter, respectively. Rec. 1. Required each course.

416. **Graphical Analysis of Engineering Problems.** Studies of graphical methods of solving various experimental problems arising in engineering practice Prerequisite: Math 213. Winter, Spring. Rec. 2 Lab. 1, 3 hr. Credit 3.

425. **Principles of Personnel Supervision.** Discussion of a series of cases of the general variety of human contacts which arise in the course of employment, with the desirable methods to meet such conditions when they occur. Prerequisite: Senior classification in Engineering. Spring. Rec. 3. Credit 3.

494. **Special Problems.** Formulation and solution of theoretical or practical problems which relate to manufacturing, public utility operation, operation of communication systems or other industrial methods. Credit 1 to 5.

694. **Industrial Engineering Research.** Mr. Paine.

GENERAL SCIENCE

See Industrial Science, page 224.

GENETICS

E. W. LINDSTROM, Head of Department

Assistant Professor Lambert; Graduate Assistants Hetzer, Harvey

For information concerning the Division of Agriculture, see page 58.

The department of Genetics offers instruction in the science of heredity particularly in relation to plant and animal breeding. Students planning to specialize in animal or plant breeding will find it essential to obtain a detailed knowledge of Genetics. In addition to emphasizing the applied or practical phases of genetics, the courses are also designed to stimulate the broader cultural and philosophical aspects of this biological science. The relation of genetics to mankind is brought up for serious consideration.

Experimental work in Genetics is under way at all times, and provides facilities for advanced study for those interested in Genetics, or in similar problems in the allied fields of Animal Husbandry, Bacteriology, Botany, Farm Crops, Horticulture, or Zoology.

Offices, classroom, laboratory, and research rooms of the department are located on the third floor of Agricultural Hall. Greenhouse space, an animal breeding laboratory, and experimental field-plots are available for advanced work.

Applied courses in genetics are also given in various departments as follows: Animal Husbandry 350 (Animal Breeding), 548 (Poultry Breeding); Farm Crops 504 (Cereal and Forage Crop Breeding), 619 (Conferences in Crop Breeding); and Horticulture 518 (Breeding of Horticultural Plants.)

Description of Courses

300. **General Genetics.** Elementary principles of heredity and their general bearing on plant and animal breeding. Prerequisite: A course in botany or zoology. Fall, Winter. Lect. 3. Credit 3.

305. **Elementary Laboratory.** Breeding experiments, illustrating the principles of heredity. Should accompany or follow 300. Fall, Winter. Lab. 1. Credit 1.

310. **Human Heredity.** Elementary principles of genetics with particular reference to eugenic problems.. Not open for credit to students taking or having had Genetics 300. Prerequisite: elementary botany or zoology. Alternate years. Offered Fall, 1937. Lect. 3. Credit 3.

530. **Advanced Genetics.** Modern conceptions of genetics, including Mendelism, linkage, mutation, selection, inbreeding, disease resistance, and biometry. Prerequisite: elementary genetics. Winter. Lect. and problems 3. Credit 3.

535. **Animal Genetics.** Advanced study of inheritance in animals. Prerequisite: elementary genetics. Spring. Lectures and problems 3. Credit 3.

540. **Special Topics.** Written problems in laboratory, greenhouse, field or library work. Prerequisite: elementary genetics. Fall, Winter, Spring. Credit 1 to 3 as arranged.

550. **Seminar.** Weekly meeting with staff to report and discuss current literature. Fall, Winter, Spring. Credit 1.

600. **General Genetics.** An orientation course including a comprehensive problem in Drosophila genetics. Fall, Winter. Lect. 3. Lab. 1. Credit 3. Mr. Lindstrom, Mr. Lambert.

605. **Cytogenetics.** (Bot. 605.) Detailed study of chromosome association and segregation, and the bearing of chromosome behavior on inheritance and evolution. Prerequisite: 300, Bot. 406. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

651, 652, 653. **Conferences on Animal Breeding Systems.** (A. H. 651, 652, 653.) Biometric relations between parent and offspring, inbreeding and outbreeding, assortative mating, the effects of selection. Application of these principles to progeny tests, selection indices, records of performance, etc. Prerequisite: 600, A. H. 350, or equivalent. Fall, Winter, Spring. Credit 2 each course. Mr. Lush.

660. **Research.** Mr. Lindstrom, Mr. Lambert.

GEOLOGY

J. T. LONSDALE, Head of Department

Associate Professor Gwynne; Assistant Professor Smith

For information concerning the Division of Industrial Science, see page 69.

The department offers fundamental courses in geology designed to give the student a knowledge of the composition of the earth, the processes which are at work upon it, and its history. For those who plan to engage in professional work in the field of geology a sequence of more advanced courses in the various sub-divisions of the science is provided, continuing through the Junior and Senior years. In the Senior year such students may take courses particularly applicable to specialized fields of geology. At least one year of graduate work is essential for those planning to engage in professional geological work.

The advanced courses in geology offered for the majors include those in mineralogy, petrology, petrography, paleontology, structural geology, stratigraphic geology, and economic geology. Various ones of these are included in the curricula in Mining Engineering and in Ceramic Engineering, and may be taken by others who are qualified. One quarter courses in elementary geology, mineralogy, and meteorology, suited to the diverse needs of students in agriculture, landscape architecture, civil engineering, and chemical engineering are also offered by the department. Fundamental work in geography is given for those wishing to gain a knowledge of the relation of agriculture and industry to the geographic environment.

The quarters of the department are located on the second floor of the Chemistry Building, and include a well-equipped museum containing many valuable collections of minerals, rocks, and paleontological specimens.

Curriculum in Industrial Science—Major Geology

For Freshman and Sophomore years, see page 226.

For Junior and Senior years, see page 227.

Summer Field Work (Geol. 400) or equivalent is required for graduation.

Description of Courses

201, 202, 203. **General Geology.** Fundamentals. (201) Composition of the earth; gradation. Fall, Winter, Spring. (202) Diastrophism, vulcanism; introduction of earth history. Winter, Spring. (203) Historical geology. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4 each course.

311, 312, 313. **Industrial Geography.** Principles of the science. (311) Applications to human relations and the fundamental industries of the world. (312) Applications to human interests in international affairs. (313) Applications to world resources and human welfare. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

314. **Agricultural Geography.** The distribution of the agricultural lands, industries, products and peoples of the world and the geographic causes of this distribution. Winter, Spring. Rec. 3. Credit 3.

324. **Physiography.** Evolution of the physical features of the earth; fundamental processes affecting their development. Spring. Rec. 4. Credit 4.

354. **Structural Geology.** The primary and secondary structures of the rocks of the earth's crust. Prerequisite: 201, 202, 203. Fall. Rec. 3. Lab. 1, 3 hr. Credit 4.

355. **Mineralogy.** The fundamentals of crystallography and of determinative and descriptive mineralogy. Prerequisite: Chem. 102. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

356. **Petrology.** The physical, mineralogical, textural, and structural characteristics of rocks; their origin and distribution. Prerequisite: 355. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

374. **Engineering Geology.** The fundamentals of the science and engineering applications. Fall. Rec. 2. Lab 1, 3 hr. Credit 3.

375. **Agricultural Geology.** The solution of geological problems met with in agricultural industries. Fall, Spring. Rec. 2. Field and lab. 1, 3 hr. Credit 3.

376. **Meteorology.** The nature of the air, winds, weather, and climate. Winter, Spring Rec. 3. Credit 3 1 or 2 labs for additional credit.

400. **Summer Field Work.** Field phenomena; geologic surveying and mapping. Prerequisite: 201, 202, 203. Summer, first term. Credit 4 to 9.

434. **Economic Geology—NonMetallics.** Origin, occurrence, and uses of the principal non-metallic mineral deposits. Prerequisite: 354, 356. Fall, Rec. 3. Lab. 1, 3 hr. Credit 4.

435 **Invertebrate Paleontology.** Characteristics and relationships of the invertebrates of the fossil record; their use in historical geology. Prerequisite: 201, 202, 203; Zool. 104, 105. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

436. **Petroleum Geology.** Origin and manner of occurrence of oil and gas; geological characteristics of important producing regions. Prerequisite: 354. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

454. **Optical Mineralogy.** Principles involved in the study of minerals with the polarizing microscope; the characteristics of the principal rock-forming minerals. Prerequisite: 355 . Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

455. **Economic Geology—Metallics.** The character and origin of ore deposits. Prerequisite: 354, 356. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

557, 558. **Petrography.** Rock sections and powders studied with the polarizing microscope. (557) Igneous rocks. Winter. (558) Sedimentary and metamorphic rocks. Spring Prerequisite: 454. Rec. 2. Lab. 2, 3 hr. Credit 4 each course.

566. **Seminar.** Prerequisite: 12 credits in geology. Fall, Winter, Spring. Credit 1 each quarter.

571, 572, 573. **Advanced General Geology.** Principles of dynamical, structural, and stratigraphic geology; phenomena of earthquakes; vulcanism; mountain making; form and structure of the earth and its past history. Prerequisite: 354, 356. Fall, Winter, Spring Rec 3. Lab. 1, 3 hr. Credit 4 each course.

574 **Petrography of Ceramic Materials.** Examination of ceramic materials with the petrographic microscope; technique of examination of fine mineral particles; geological occurrence; and characteristics of ceramic materials. Prerequisite: 454. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

664 **Special Problems.** Prerequisite: 36 credits in geology. Mr. Lonsdale, Mr. Gwynne.

665. **Research.** Mr. Lonsdale, Mr. Gwynne.

HISTORY AND GOVERNMENT

L. B. Schmidt, Head of Department

Associate Professors Cook, Moody, Ross, Rutherford

For information concerning the Division of Industrial Science, see page 69.

The department provides basic courses of instruction in history and government for students in all divisions of the College; fundamental and specialized courses for teachers; and research work in economic history along either major or minor lines. These subjects are included: first, to furnish such knowledge and training as it is believed should be part of any college education; second, to provide advanced work for those students who need a more thorough knowledge of history and government for teaching or for public service; and, third, to train men and women for intelligent citizenship. The college library offers good facilities for both undergraduate and graduate students in these subjects.

Curriculum in Industrial Science: Major Economic History

Curriculum in General Science: Major Economic History

For Freshman and Sophomore years, see page 226.

For general instructions regarding the Junior and Senior years, see page 227.

Description of Courses

HISTORY

Note: Any subject listed in the following History sequences may be taken independently: 401, 402, 403; 421, 422, 423.

211, 212, 213. **Introduction to the Social Sciences.** Field of the social sciences; factors in civilization; historical foundations of modern civilization; development of institutions; and study of a limited number of contemporary problems. This course is not a substitute for any of the introductory courses in the social sciences. Not open to senior college students without permission of instructor. Must be taken in consecutive order. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

234, 235. **Economic History of the United States.** (Not open to senior college students.) (234) *To 1860.* European and environmental foundations; colonial origins of agriculture, industry, and commerce; expansion and sectional division. Winter. (235) *Since 1860.* The triple economic revolution in agriculture, industry, and transportation; national unification and consolidation; problems and tendencies. Spring. Rec. 3. Credit 3 each course.

324. **Economic History of the United States.** Colonial foundations; the westward movement; the public lands; transportation; regional specialization; the revolution in agriculture, industry, and commerce; the labor movement; the farmers' movement; currency and banking; the tariff; and economic aspects of the World War and reconstruction. Not open to students who have had 234 or 235. Fall, Winter, Spring. Rec. 3. Credit 3.

401, 402, 403. **Economic History of Europe.** (401) *England.* English agriculture, industry and commerce from the Anglo-Saxon conquest to the present with emphasis on the development of economic institutions. Prerequisite: 3 credits of history. (402) *Modern Europe.* European agriculture, industry, and commerce since 1760, with emphasis on the development of economic institutions. Prerequisite: 3 credits of history. (403) *European Expansion and World Politics.* Causes, motives, workings, and effects of contemporary European imperialism in Africa, the Near East, the Middle East, the Far East, and the Pacific Islands. Prerequisite: 3 credits of history. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

421, 422, 423. **History of the American Nation.** (421) *Foundations to 1789.* European background; colonial development and institutions; British colonial policy; causes of the revolution; the birth of the nation; and the establishment of the Constitution. Prerequisite: 6 credits of history. (422) *The Middle Period from 1789 to 1865.* Westward expansion; land questions; political parties and party problems; the rise of the New West; industrial and agricultural expansion; cultural development; foreign relations; slavery; and the War between the States. Prerequisite: 6 credits of history. (423) *The Recent Period from 1865 to the Present.* The economic revolution; the new issues with their economic, political, and intellectual background; and the emergence of the United States as a world power. Prerequisite: 6 credits of history. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

496. **Methods of Teaching the Social Sciences.** (Voc. Ed. 496.) Methods of teaching history, government, economics, and sociology in the high schools and junior college. Prerequisite: 15 credits of history including Hist. 211, 212, 213, or equivalent. Alternate years. Offered Spring, 1937. Rec. 3. Credit 3.

520. **Economic History of American Agriculture.** Colonial foundations; westward movement of population and agricultural systems; public land policies in relation to agricultural expansion; regional specialization; transportation; home and foreign markets; agrarianism and industrialism; the farmer's movement; politics and legislation; present agricultural situation. Prerequisite: 324 and 6 credits of advanced history or equivalent. Winter. Rec. 3. Credit 3.

534. **The Trans-Mississippi West.** European and aboriginal backgrounds; territorial acquisitions; the westward movement; economic, social, and political development. Special attention given to the Prairies and the Great Plains in American History. Prerequisite: 234 and 6 credits of advanced history. Spring. Rec. 3. Credit 3.

564. **Foreign Relations of the United States.** Colonial foundations; the French Alliance and independence; the struggle for neutrality; the Monroe Doctrine; territorial expansion; the Mexican War; the Civil War; Latin American relations; the Far East and problems of the Pacific; intervention in Europe; present problems and policies. Prerequisite: 324 and 6 credits of advanced history. Spring. Rec. 3. Credit 3.

565. **The United States and Latin America.** Economic, political, strategic, and humanitarian factors in our relations with the countries composing Latin America and the foreign policies of the United States as they have been adapted to expanding national interests. Prerequisite: 324 and 6 credits of history. Winter. Rec. 3. Credit 3.

568. **International Economic Policies.** International politics with emphasis on the economic foreign policies of the Great Powers as they have been adapted to expanding interests, and the bearing of these policies on international relations and on the problems of international organization. Prerequisite: 324 and 6 credits of advanced history. Fall. Rec. 3. Credit 3.

595. **Seminar in Economic History.** Fall, Winter, Spring. Credit 2 or 3 each quarter.

604 **Research in Economic History.** Messrs. Moody, Ross, Schmidt.

GOVERNMENT

214. **American Government.** Not open to senior college students. Historical origins; fundamental principles; organization, functions, and workings of the federal system; examination of the constitution of the United States and of Iowa; principles of a republican form of government; relation of the national government to agriculture, industry, business, and commerce. Fall, Winter, Spring. Rec. 3. Credit 3.

315. **American Government.** Similar to 214. For upper-class students. Fall, Winter, Spring. Rec. 3. Credit 3.

424. **State and Local Government in the United States.** Historical foundations; present organization and functions; special problems, including the reorganization of state and local administration; financial and budgetary proposals; civil service principles. Prerequisite: 214 or 315. Fall. Rec. 3. Credit 3.

435. **Municipal Government.** Historical foundations of American city government; city manager form of city government and city manager problems; efficiency in city government. Prerequisite: 214 or 315. Winter. Rec. 3. Credit 3.

436. **Municipal Problems.** The city in action; problems of administrative organization and personnel; legal aspects of city planning and zoning; municipal finance; regulation of public utilities; municipal ownership; special problems of muncipal administration arising out of the depression. Prerequisite: 214 or 315. Spring. Rec. 3. Credit 3.

446. **European Governments.** Comparative examination of the governments of England, France Germany, Italy, and Switzerland; political problems of these countries; comparisons with the United States. Prerequisite: 214 or 315. Spring. Rec. 3. Credit 3.

468. **Political Parties and Party Problems.** Historical development of political parties· bases of party affiliations; party organization; selected party problems, including the direct primary, party finance, and the conduct of elections; party issues. Prerequisite: 214 or 315. Alternate years. Offered Fall, 1936. Rec. 3. Credit 3.

476. **Public Administration.** Principles applied to national, state, and local governments; problems of organization, personnel, equipment, and financial procedure; reorganization of government; current problems and tendencies in Iowa. Prerequisite: 6 credits of government. Winter. Rec. 3. Credit 3.

495. **Special Topics.** State or rural governments; the recovery administration of the national government; current party problems.

HOME ECONOMICS

GENEVIEVE FISHER, Dean of Home Economics

For general information concerning the Division, see page 67.

The Division of Home Economics offers the following curricula leading to the degree of Bachelor of Science:

Graduate work leading to the degree of Master of Science is offered by all departments in the division. See page 86.

Courses in the Divisions of Agriculture, Engineering, and Industrial Science are open to Home Economics students as electives. Certain basic subjects are required in each of the various curricula and a uniform Freshman year precedes the choice of curricula.

Curricula in the Division of Home Economics

For entrance requirements, see page 36.

UNIFORM FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Elementary Design A.A. 104[1]	2	Elementary Design A.A. 105	3	Household Equipment H Eq. 154	3
General Chemistry Chem. 105	4	General Chemistry Chem. 106	4	†General Physics Phys 106	4
Composition Engl. 101	3	Composition Engl. 102	3	‡Composition Engl. 103	3
Health Education Hyg. 104	3	Textiles T.&C. 104	3	Biology Zool. 104	3
Introd. to Social Sciences Hist. 211	3	Introd. to Social Sciences Hist. 212	3	Introd. to Social Sciences Hist. 213	3
Physical Education Phys.Ed. 121	R[3]	Physical Education Phys.Ed. 122	R	Physcial Education Phys.Ed. 123	1*
	15		16		17

In addition to the courses listed above, each student will be required to include in his schedule: H.Ec. 101, 102, 103. Psych. 110 and Library 106B make up the requirement of H.Ec. 101 in the Fall quarter.

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.
[3]R indicates that the course is required, without credit, for graduation.
†Those who plan to elect the curriculum in Foods and Nutrition and Chemistry (see page 201) must elect Chem. 108 in place of Physics 106.
*One credit is given upon the completion of three quarters' work.
‡Students making less than a quality point average of 1.5 in Freshman English will be required to enroll for additional work in English Composition.

SOPHOMORE, JUNIOR, AND SENIOR YEARS

At the beginning of the Sophomore year each student must choose one of the following curricula: Applied Art, Child Development, Dietetics, Nutrition, Foods and Nutrition and Chemistry, Home Economics Education, Home Management, Household Equipment, Institution Management, Textiles and Clothing, Home Economics (with major in Home Economics Extension, or Technical Journalism).

For details of the above curricula, see the following pages.

Description of Course

101, 102, 103. **Orientation.** (101) Social ethics and library. (Psych. 110 and Lib. 106B.) Fall. (102, 103) Survey of opportunities in the field of home economics as a basis for choice of major. Winter, Spring. Required of all freshmen in home economics. Lect. 1. Required each course.

APPLIED ART

JOANNE M. HANSEN, Head of Department

Associate Professors Fisher, O'Bryan; Assistant Professors Henderson, Russell; Instructors Kitt, Lepley, Ness, Teter, Waugh; Extension Workers Garner, Wilson, Workman

The Department of Applied Art offers instruction involving the use of art elements and the application of fundamental design principles to the needs of the individual and the home.

The courses are planned with the objectives of creating a more sensitive consciousness of good design and of beauty; of promoting a strong desire to eliminate or transform ugliness into beauty; of acquiring certain skills and appreciations that will enrich life and make leisure more profitable; of developing good judgment, wise selection and discrimina-

tion in the buying and use of material things in relation to daily living and to the home; of realizing the importance which the general public, periodicals, daily papers, and advertising give to art qualities found in the things of every day life.

There is a growing demand in professional and commercial fields for women trained in applied art who have the home economics viewpoint. For teachers and extension specialists in home furnishing; for merchandise advisors, buyers and designers; for assistant designers and consultants in interior decoration; for the many phases in commercial design, broad training is highly desirable.

For those students who demonstrate to the Applied Art department that they have more than average ability in this field the curriculum outlined below is open. Advanced credit students are requested to bring representative work.

Curriculum in Applied Art

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Drawing and Composition A.A. 221	2	Drawing and Composition A.A. 222	2	Drawing and Composition A.A. 223	2
Food Preparation F.&N. 204	4	House Planning A.A. 260	2	Interior House Design A.A. 264	3
Applied Organic Chem. 264	5	*Food Preparation F.&N. 205	4	General Psychology Psych. 204	3
Costume Design T.&C 144	3	Food Analysis Chem. 266	3	Clothing T.&C. 224	3
Plan. Home Landscapes L.A. 206	2	American Government Govt. 214	3	Nineteenth Century Engl. 255	3
		Nineteenth Century Engl. 254 or Technical Journalism T.Jl. 225B	3	Music Appreciation Music 144	1
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1**
	16		17		16

*Home Experience, F.&N. 207, required upon completion of F.&N. 205 See page 202.
**One credit is given upon the completion of three quarters' work.

JUNIOR YEAR

Household Bacteriology Bact. 304B	5	Meal Planning F.&N. 303	4	Applied Sociology Ec. 384	3
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Child . & Adolescence Psych. 415	3	Amer. Masterpieces Engl 364 or Fiction Engl. 454,455,456	3	Extempore Speaking P.S. 311	3
Cons. & Decor. Design A.A. 344	2	Craft Design A.A 345	2	Home Made Pottery Cer. E. 324	2
Electives	3	Commercial Design A.A. 305	2	Draw. & Composition A.A. 524	2
		Electives	2	Electives	3
	16		16		16

SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Art Appreciation A.A. 484	3	Art Appreciation A.A. 585	2	Art Appreciation A.A. 586	2
Textile Design A.A. 434	3	Textile Design A.A. 535	2	Manuscript Decoration A.A. 507	2
Child Care and Training C D. 485	3	Home Management H.Mgt. 474	3	Craft Design A.A. 546	2
Advanced Composition Engl. 304	3	Home Mgt. House H.Mgt. 475	4	Interior House Design A.A. 565	3
Electives	3	Historic Textiles T.&C. 514	3	Drama Engl. 464	3
		Electives	3	Electives	3
	15		17		15

Description of Courses

104. **Elementary Design.** Elements of design, and the development and application of fundamental art principles and color theories through problems in art structure. Fall, Winter. Lab. 3, 2 hr. Credit 2.

105. **Design.** Problems and projects in design requiring judgment in selection and creative work in the use of line, form, dark and light, color and texture. Prerequisite: 104. Fall, Winter, Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

221, 222, 223. **Drawing and Composition.** (221) Rapid sketching and free expression with wide range of subjects and mediums. (222, 223) Perspective, landscape and figure sketching in line, form, and color with emphasis upon dark and light, and unity in composition. Prerequisite: 221. (223) Prerequisite: 222. Fall, Winter, Spring, respectively. Lab. 3, 2 hr. Credit 2 each course.

260. **House Planning.** The exterior and interior of the house planned for convenience, economy, and beauty. Prerequisite: 105. Fall, Winter, Spring. Lab. 3, 2 hr. Credit 2.

264. **Interior House Design.** The furnishing of a home of moderate means, as planned in 260, considering convenience, comfort, simplicity and beauty. Prerequisite: 260. Fall, Winter, Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

305. **Commercial Design.** Lettering and design in dark and light and color in relation to advertising art with mediums suitable for reproduction. Prerequisite 105. Winter. Lab. 3, 2 hr. Credit 2.

344. **Constructive and Decorative Design.** Problems in wood carving, basketry, weaving, and rug design. Prerequisite: 105. Fall, Winter. Lab. 3, 2 hr. Credit 2.

345. **Craft Design.** Book-binding, leather, and metal. Prerequisite: 105. Winter, Spring. Lab. 3, 2 hr. Credit 2.

400. **Special Problems.** Credit and hours as arranged. Fall, Winter, Spring.

434. **Textile Design.** Tie-dye, batik, and block printing; contemporary designers and textiles. Prerequisite: 105, T. & C. 104. Fall, Winter, Spring. Lect. and lab. 2, 3 hr. Credit 3.

445. **Constructive and Decorative Design.** The development of original pattern and color combinations through textile weaving. Prerequisite: 344. Spring. Lab. 3, 2 hr. Credit 2.

484. **Art Appreciation.** A survey of architecture, sculpture, and painting from prehistoric to modern times. Prerequisite: 105. Fall, Winter, Spring. Lect. 3. Credit 3.

504. **Seminar.** Credit and hours as arranged. Winter. Miss Hansen.

507. **Manuscript Decoration.** Decorative motives and ancient styles of lettering, with emphasis upon original modern adaptations. Prerequisite: 305. Spring. Lab. 3, 2 hr. Credit 2.

524. **Drawing and Composition.** Decorative composition in dark and light and color, based upon previous sketches and assigned subjects. Prerequisite: 223. Spring. Lab. 2, 3 hr. Credit 2.

535. **Textile Design.** Creative design appropriate for batik and decorative stitchery, with emphasis upon use, composition, color, and technique. Prerequisite: 434. Winter. Lab. 2, 3 hr. Credit 2.

546, 547. **Craft Design.** (546) Metal working, silver smithing, and jewelry. Prerequisite: 345. Spring. (547) Constructive application of design to leather, metal, wood, and other materials. Prerequisite: 344, 345. Spring. Lab. 3, 2 hr. Credit 2 each course.

565, 566. **Interior House Design.** Scale, line, form, value, texture, and color in the selection, use and adaptation of period and contemporary furnishings of distinctive styles to homes of today. (565) Spring. Prerequisite: 264. (566) Spring. Prerequisite: 565. Rec. 1. Lab. 2, 3 hr. Credit 3 each course.

585, 586. **Art Appreciation.** Prerequisite: 484, Hist. 211. (585) Medieval and Renaissance Art. Winter. (586) Modern and Contemporary Art. Spring. Rec. 2. Credit 2 each course.

604. **Advanced Design.** Fall, Winter, Spring. Miss Hansen, Miss Henderson.

614. **Research.** Miss Hansen, Miss Henderson.

CHILD DEVELOPMENT

LYDIA V. SWANSON, Acting Head of Department

Professor Vance; Assistant Professor Lowenberg; Instructors Mumford, Sunderlin; Graduate Assistant Onstad; Fellow Snyder
Extension Worker Jones

The purpose of this department is to give students a better understanding and appreciation of children. The four infants in the home management houses, the twenty-five nursery school children, ages two to five, the play groups made up of grade school children coming to the nursery school at stated times, offer unique opportunities to study child life at the various ages. In addition, the departments of nutrition, hygiene, physiology, psychology, and physical education offer courses which emphasize particular phases of child development.

Specialization in this department prepares students for nursery school teachers and nutritionists, also for leaders in parent education programs.

Through affiliation with the Merrill-Palmer School of Homemaking, Detroit, Michigan, two senior college students showing especial ability in the field of child development are elected every quarter to study at that institution. This privilege gives the students opportunities to become familiar with phases of child life which the College does not offer.

Curriculum in Child Development

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Applied Organic Chem. 264	5	Food Chemistry Chem. 266	3	Physiol. & Nurt. Chem. Chem. 274	3
House Planning A.A. 260	2	Food Preparation F.&N. 204	4	Food Preparation F.&N. 205	4
Human Physiology Zool. 255	5	Nineteenth Century Engl. 254 or Technical Journalism T.Jl. 225B	3	American Government Govt. 214	3
Act. in Nursery School C.D. 230	3	Costume Design T.& C.144	3	Clothing T.&C. 224	3
		General Psychology Psych. 204	3	Interior House Design A.A. 264	3
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	15		16		17

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Household Bacteriology Bact. 304B	5	Meal Planning F.&N. 303	4	Nutrition & Dietetics F.&N. 305	4
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Child. & Adolescence Psych. 415	3	Child Care and Training C.D. 435	3	Play & Play Materials C.D. 440	2
Nineteenth Century Engl. 254 or 255 or **Electives in English	3	Extempore Speaking P.S. 311	3	Applied Sociology Ec. 384	3
Electives	3	Electives	3	Electives	3
	17		16		15

SENIOR YEAR

Advanced Child Psych. Psych. 416	3	Home Management H.Mgt. 474	3	Advanced Child Care C.D. 536	3
Seminar C.D. 465	2	Home Mgt. House H.Mgt. 475	4	Children's Clothing T.&C. 526	3
Nutrition of Children F.&N. 506	3	Home Relationships H.Mgt. 584	3	Physical Development C.D. 545	2
Techniques of Guidance C.D. 550	4	Child Physiology Zool. 558	3	Art Appreciation A.A. 484	3
Electives	4	Electives	3	Textile Economics T.&C. 464	2
				Electives	3
	16		16		16

*One credit will be given upon the completion of three quarters' work.
**Students who elect T.Jl. 225 in Sophomore year take Engl. 254 or 255.
Suggested electives for Child Development: A.A. 221; Engl. 304, 305; F.&N. 504; I.A. 106, Ec. 385; Gen. 310; P.S. 104; Phys.Ed. 304; Cer.E. 324; Zool. 105, 234, 224; Phys. 301, 302 303; Psych. 334; Mod.Lang. 201, 202, 203; 231, 232, 233; Voc.Ed. 304, 305, 306.

Description of Courses

230. **Activities in the Nursery School.** An introductory course planned especially for Child Development majors. Observational studies on activities carried on by children of pre-school age. Fall. Rec. 1. Lab. 2, 3 hr. Credit 3. Not open to Freshmen.

435. **Child Care and Training.** Factors involved in physical, mental, social, and emotional development of children, with discussion of problems in the home. Observation and participation in nursery school. Fall, Winter, Spring. Prerequisite: credit or classification in Psych. 415, F.&N. 205. Rec. 3. Lab. 2, 1 hr. Credit 3.

440. **Play and Play Materials.** An investigation of literature, music, art, clay modeling, together with play equipment suitable for pre-school children. Spring. Prerequisite: 435. Rec. 1. Lab. 1, 3 hr. Credit 2.

465. **Seminar.** Preparation and presentation of reports on original investigations in child development. Prerequisite: 435 and senior classification. Fall. Rec. 2. Credit 2.

536. **Advanced Child Care and Training.** For students majoring in child development, home economics education and other fields concerned with young children. Additional experience with young children and a survey of literature to give a better understanding of child life. Fall, Winter, Spring. Prerequisite: 435. Rec. 2. Lab. 1, 3 hr. Credit 3.

545. **Physical Development.** Emphasis on environmental factors as they influence health of infants and young children. Prerequisite: 435. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

550. **Techniques of Guidance.** Observation and practical experience in guidance of children in nursery school. Emphasis on growth promoted through children's interests and activities. Prerequisite: 440. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

555. **Special Topics.** Fall, Winter, Spring. Prerequisite: 435.

614. **Research.** Mr. Vance.

665. **Seminar.** Fall, Winter, Spring. Mr. Vance.

666. **Nursery School Organization.** Administration of nursery schools with emphasis on budget, housing, equipment; staff, parent, and student participation. Prerequisite: Credit or classification in 550. Winter. Credit and hours as arranged. Miss Swanson.

667. **Infant Care.** For those preparing to direct home management houses. Emphasis on the twenty-four hour care of infants. Prerequisite: 435, H. Mgt. 475. Summer, first term. Rec. 2. Lab. 4, 3 hr. Credit 3. Miss Swanson

FOODS AND NUTRITION

P. MABEL NELSON, Head of Department

Associate Professors Lowe, Ohlson, Swanson; Assistant Professors L'Engle, Lowenberg, Shilling; Instructors Enblom; Kirkpatrick; Fellows Armstrong, King

Extension Workers Anderson, Cessna, Peterson, Swinney

The department offers courses designed to acquaint the student with the principles underlying the selection, preparation, and use of foods in the proper nutrition of the individual. Students electing a curriculum in Foods and Nutrition may prepare themselves for appointments in dietetics, nutrition, social welfare, commercial foods service, and research.

The sequence of required courses for Freshmen in Home Economics is specified on page 194. The choice of electives in the Sophomore, Junior, and Senior years vary with the major interest of the student.

The curriculum in dietetics is designed to prepare the student for hospital training. Following graduation, a post-graduate curriculum of 8 to 12 months must be taken in a hospital approved by the American Dietetic Association. After completion of this training and one year of experience, the student is eligible to membership in the American Dietetic Association.

The curriculum in nutrition is designed for nutrition specialists and social welfare workers, or those preparing for commercial foods appointments. Courses in education and animal nutrition are advised for nutrition specialists; sociology, psychology, and child development, for welfare workers; large quantity cookery and catering for those preparing for commercial foods appointments.

The curriculum in foods and nutrition and chemistry is designed to prepare the student for research or graduate study in foods or nutrition or related fields. The home economics curriculum is supplemented with outlined courses in chemistry, physics, and mathematics, which are taken instead of the indicated electives. Foreign language is advised for those contemplating graduate study.

Transfer students must satisfy the home experience project, F.&N. 207, before registering for advanced courses in foods. Practical examinations for credit in home and previous experience are given once each quarter, following mid-quarter examinations.

Curriculum in Dietetics

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation F.&N. 204	4	Food Preparation *F.&N. 205	4	Humar Physiology Zool. 255	5
Applied Organic Chem. 264	5	Food Chemistry Chem. 265	5	Physiol. & Nutr. Chem. Chem. 275	5
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Costume Design T.&C. 144	3	House Planning A.A. 260	2	Interior House Design A.A. 264	3
		Early 19th Century Engl. 254 or Technical Journalism T.Jl. 225B	3		
Physical Education Phys.Ed.221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1**
	15		17		17

*Home Experience, F.&N. 207, required upon completion of F.&N. 205. See page 202.
**One credit is given upon the completion of three quarters' work.

JUNIOR YEAR

Large Quantity Cookery I.Mgt. 380	4	Meal Planning F.&N. 303	4	Nutrition and Dietetics F.&N. 305	4
Household Bacteriology Bact. 804B	5	Applied Sociology Ec. 384	3	Mid-19th Century Engl. 255 or **Electives in English	3
American Government Govt. 315	3	General Psychology Psych. 204	3	Extempore Speaking P.S. 311	3
Electives	3	Clothing T.&C. 224	3	Child. & Adolescence Psych. 415	3
		Electives	3	Electives	3
	15		16		16

**Students who elect T.Jl. 225 in the Sophomore year take Engl. 254 or 255.

SENIOR YEAR

Experimental Cookery F.&N. 511	3	Art Appreciation A.A. 484	3	Home Management H.Mgt. 474	3
Accounting Ec. 374	4	Child Care and Training C.D. 435	3	Home Mgt. House H.Mgt. 475	4
Purchasing I.Mgt. 484	3	Child Physiology Zool. 558	3	Institution Administration I.Mgt. 587	3
Nutrition and Dietetics F.&N. 404	2	Textile Economics T.&C. 464	2	Methods for Dietitians F &N. 518	3
Electives	3	Nutrition of Children F.&N. 506	3	Electives	3
		Abnormal Nutrition and Dietetics F.&N. 504	3		
	15		17		16

Curriculum in Nutrition

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation F.&N. 204	4	Food Preparation *F.&N. 205	4	Clothing T.&C. 224	3
Applied Organic Chem. 264	5	Food Chemistry Chem. 265	5	Physiol. Chemistry Chem. 275	5
Costume Design T.&C. 144	3	House Planning A.A. 260	2	Interior House Design A.A. 264	3
American Government Govt. 214	3	Technical Journalism T.Jl. 225B	3	English Engl. 255	3
		General Psychology Psych. 204	3		
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1**
	15		17		15

*Home Experience, F.&N. 207, required upon the completion of F.&N. 205. See page 202.
**One credit is given upon the completion of three quarters' work.

JUNIOR YEAR

Meal Planning F.&N. 303	4	Human Physiology Zool. 255	5	Nutrition and Dietetics F.&N. 305	4
Household Bacteriology Bact. 304B	5	Extempore Speaking P.S. 311	3	Extempore Speaking P.S. 312	3
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Applied Sociology Ec. 384	3	Electives	4	Textile Economics T.&C. 464	2
				Feature Writing T.Jl. 335	3
				Electives	3
	15		15		18

SENIOR YEAR

Nutrition of Children F.&N. 506	3	Child Care and Training C.D. 435	3	Home Management H.Mgt. 474	3
Experimental Cookery F.&N. 511	3	Child Psychology Zool. 558	3	Home Mgt. House H.Mgt. 475	4
Child. & Adolescence Psych. 415	3	Nutrition and Dietetics F.&N. 404	2	**Electives	9
Art Appreciation A.A. 484	3	*Experimental Cookery F.&N. 512	3		
**Electives	5	**Electives	5		
	17		16		16

*Students preparing for nutrition or social work omit F.&N. 512 and take T.Jl. 321.

**Students preparing for nutrition or social work take Ec. 386, 518, and 588 and in addition, elect 6 hours from the following: Ec. 385, 515, 517; Voc.Ed. 305; H.Ec.Ed. 406, 517; H.Mgt. 584; Psych. 444 or 414; and F.&N. 505. Students preparing for commercial foods take F.&N. 513, Chem. 586D (Cr. 3), and in addition elect 6 hours from the following: T.Jl. 321; I.Mgt. 380, 383, 580; H.Eq. 435, 521, 522, or 523.

Curriculum in Foods and Nutrition and Chemistry

Leading to the degree of Bachelor of Science.

For Freshman year, see page 194, Chem. 103 instead of Phys. 106.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation F.&N. 204	4	Food Preparation *F.&N 205	4	Principles of Economics Ec. 211	3
Quantitative Analysis Chem. 211	4	Quantitative Analysis Chem. 212	4	Quantitative Analysis Chem. 213	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	Analytic Geometry Math. 103	5
Human Physiology Zool. 255	5	American Government Govt. 214	3	General Psychology Psych. 204	3
				Early 19th Century Engl. 254 or Technical Journalism T.Jl. 225B	3
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1**
	18		16		18

*Home Experience, F.&N. 207, required upon the completion of F.&N. 205.
**One credit is given upon the completion of three quarters' work.

JUNIOR YEAR

Organic Chemistry Chem. 331	4	Organic Chemistry Chem. 332	4	Organic Chemistry Chem. 333	4
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
General Physics Phys. 301	4	General Physics Phys. 302	4	General Physics Phys. 303	4
Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3	Child. & Adolescence Psych. 415	3
	15		15		15

SENIOR YEAR

Physical Chemistry Chem. 321	4	Physical Chemistry Chem. 322	4	Extempore Speaking P.S. 311	3
Physiological Chemistry Chem. 474	3	Food Analysis Chem. 345	4	Child Care and Training C.D. 435	3
†German M.L. 441	3	†German M.L. 442	3	†German M.L. 443	3
Household Bacteriology Bact. 304B	5	Nutrition and Dietetics F. &N. 305	4	Seminar F.&N. 404	2
		Textile Economics T.&C. 464	2	Art Appreciation A.A. 484	3
				Special Topics F &N. 507	1
	15		17		15

†An elective may be substituted if approved by the head of the department.

Description of Courses

204, 205. **Food Preparation.** Composition, selection, and preparation of food; factors of cookery; analysis of recipes and standard products. (204) Prerequisite: Chem. 106. Fall, Winter, Spring. (205) Prerequisite: 204. Fall, Winter, Spring. Lect. 1. Rec. 1. Lab. 3, 2 hr. Credit 4 each course.

207. **Home Experience.** All students must have, in addition to the prescribed foods subjects, some practical experience before graduation. The home experience project has been designed for this purpose. It should follow F.&N. 205. Completion of the project and the practical examination are prerequisite to registration in Meal Planning, F.&N. 303.

303. **Meal Planning.** The choice, purchase, preparation, and service of food considering dietary standards, food habits and nutritional needs of the group. Prerequisite: 205 or 304, 207 and Home Experience examination, Chem. 264. Lect. and lab. 3, 3 hr. Credit 4. Fall, Winter, Spring.

304. **Advanced Food Preparation.** Factors affecting the preparation of standard food products from the experimental viewpoint. Prerequisite: 205 or 207. Fall, Winter, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

305. **Nutrition and Dietetics.** Principles of normal human nutrition. Application of practical feeding problems of the individual. Calculation and preparation of dietaries. Prerequisite: 303, Bact. 304B, Chem. 274 or 275, and Zool. 225. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

404. **Seminar in Nutrition and Dietetics.** Prerequisite: 305. Fall, Winter, Spring. Rec. 2. Credit 2.

406. **Fundamentals of Food Selection and Preparation.** Principles of cookery, meal planning and preparation adapted to forestry, engineering, scout camps, and organized houses. Open to Juniors and Seniors in forestry. Spring. Lect. 1. Rec. 1. Lab. 1, 3 hr. Credit 1 to 3.

504. **Diet in Disease.** Impaired digestive or metabolic conditions and dietetic treatment. Prerequisite: 305. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

505. **Field Work in Nutrition.** Malnutrition, its causes and prevention; observations of school children; contacts with school nurse, city social work director, parent-teacher groups. Prerequisite: 506. Fall, Spring. Lect. 1. Lab. 1 or 2, 3 hr. Credit 2 or 3.

506. **Nutrition of Children.** Infant feeding, development of food habits, dietary standards, food requirements of various ages and indices of nutrition. Prerequisite: 305. Fall, Winter, Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

507. **Special Topics.** Prerequisite: 305. Fall, Winter, Spring.

511, 512, 513. **Experimental Cookery.** (511) Sugar cookery; heat penetration; vegetable and egg cookery; batters and doughs. Prerequisite: 205, and Chem. 265. Fall, Winter, Spring. (512) Emulsions, fats, and oils; meats; gelatin and milk. Prerequisite: 511. Winter, Spring. (513) Special problems. Prerequisite: 511. Fall, Winter, Spring. (511, 512) Rec. 1. Lab. 2, 3 hr. Credit 3 each course. (513) Credit and hours as arranged.

518. **Methods of Teaching Hospital Dietietcs.** Objectives, technics, and organization of subject matter in dietetics and nutrition for teaching medical and dietitian internes, student nurses, and patients in hospitals. Prerequisite: 504. Fall, Winter. Rec. 3. Credit 3.

604. **Laboratory Methods in Nutrition.** Emphasis on nitrogen, calcium, iron, and phosphorous determinations. Vitamin studies. Prerequisite: 305, and classification in Chem. 474. Fall. Lect. 1. Lab. 5, 3 hr. Credit 6. Miss Swanson.

605. **Advanced Nutrition and Dietetics.** Recent developments in nutrition with selected problems. Prerequisite: 604. Winter. Lect. 2. Lab. 3, 3 hr. Credit 5. Miss Swanson.

609. **Seminar.** Fall, Winter, Spring. Misses Nelson, Swanson, Lowe, Ohlson.

614. **Research.** (A) Nutrition. (B) Foods. Misses Nelson, Swanson, Lowe, Ohlson.

HOME ECONOMICS EDUCATION

(Administered jointly by the Home Economics Division and the Department of Vocational Education.)

CORA B. MILLER, Head of Department

Associate Professors Friant, Turner; Assistant Professors Chadderdon, McKibben, Lyle; Instructor Peckinpaugh; Graduate Assistant Hunter

The work in this department is planned to meet the state requirement in education, psychology, and home economics for a teacher's standard secondary certificate in Iowa. Opportunity is offered for supervised teaching in Home Economics in typical Iowa schools.

The standard secondary certificate requires, in addition to the major subject, the completion of at least 15 quarter credits in each of two additional subject matter fields.

The following subjects, in addition to those required for all students in the department, are suggested for those desiring to be recommended for teaching in the specified fields.

English: 254, 255, 205 or 304, 394.

History: 534, 564.

Mathematics: 101, 102A, 103, 300, 497.

General Science—Botany: 101, 103, Geol. 201.

Students who wish to teach home economics should elect this curriculum.

Curriculum in Home Economics Education

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation F.&N. 204	4	Food Preparation F.&N. 205	4	Human Physiology Zoo. 255	5
Costume Design T.&C. 144	3	Applied Organic Chem. 264	5	Food Chemistry Chem. 266	3
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
General Psychology Psych. 204	3	House Planning A.A. 260	2	Interior House Design A.A. 264	3
American Government Govt. 214	3	Clothing T.&C. 224	3		
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	16		17		15

JUNIOR YEAR

Household Bacteriology Bact. 304B	5	Physiol. & Nutr. Chem Chem. 274	3	Dietetics F.&N. 305	4
Advanced Clothing T.&C. 324	4	Meal Planning F.&N. 303	4	Applied Sociology Ec. 384	3
Educational Psychology Psych. 334	3	Child. & Adolescence Psych. 415	3	Child Care and Training C.D. 435	3
Principles of Education Voc.Ed. 304	3	Meth. of Teach. Voc. Subj. Voc.Ed. 305	4	Meth. of Teaching H.Ec. H.Ec.Ed. 406	4
		Electives	3	Electives	3
	15		17		17

SENIOR YEAR

Supervised Teaching H.Ec.Ed. 407	4	Home Management H.Mgt. 474	3	Princ. of Sec. Education Voc.Ed. 306	3
Textile Economics T.&C. 464	2	Home Mgt. House H.Mgt. 475	4	World Literature Engl. 354 or Drama Engl. 464	3
Extempore Speaking P S. 311	3	Amer. Masterpieces Engl. 364 or Technical Journalism T.Jl. 225B	3	Adv. Child Care & Train. C.D. 536	3
Art Appreciation A.A. 484	3	Electives	6	Electives	6
Electives	4				
	16		16		15

*One credit will be given upon the completion of three quarters' work.

Vocational Certificate

The department is approved by the Federal Board for Vocational Education for the training of teachers of Homemaking. Students who desire to teach in the federally aided (Smith-Hughes or George Reed) schools of the state must complete the curriculum in Home Economics Education, plus the following subjects:

Home Economics Education 514	3 cr.
Home Economics Education 507	2 cr.
Home Economics Education 508	3 cr.
Home Experience (consult counselor)	R
	8 cr.

Extension Major

Mature students who are interested in receiving training which will prepare them for work in the Extension field may omit from the Home Economics Education curriculum, Vocational Education 304 and 306; and Psychology 334. The following courses must be added:

Ec. 386—Rural Sociology	3 cr.
Ec. 587—Rural Community Organization	3 cr.
H.Ec.Ed. 517—Methods in Extension	3 cr.

Description of Courses

406. **Methods of Teaching Home Economics.** (Voc. Ed. 406.) Objectives for home economics courses in high school. Selection of problems for realizing objectives. Methods of presenting problems. Uses of objective material. Directed observation and participation in teaching. Prerequisite: Voc. Ed. 305, and completion of two quarters of junior year. Rec. 3. Lab. 1, as arranged. Credit 4.

407. **Supervised Teaching in Home Economics.** (Voc. Ed. 407.) Supervised teaching in public schools having co-operative agreement. Prerequisite: Credit or classification in 406. Fall, Winter, Spring. Labs. as arranged. Credit 4.

504. **Special Topics in Home Economics Education.** (Voc. Ed. 504.) Prerequisite: 406.

506. **Teaching Human Relationships in the Public Schools.** (Voc. Ed. 506.) Objectives, selection of material, and problem organization of courses in human relationships, including family and community relationships, child care, and personality development. Prerequisite: 407, C.D. 435, H. Mgt. 474, or equivalent. Rec. 6. Credit 3. Summer, second term.

507. **Methods of Teaching Related Art.** (Voc. Ed. 507.) Objectives for related art courses in vocational schools. Selection of problems for teaching and methods of presenting problems Use of references and illustrative materials. Prerequisite: Voc. Ed. 305 and A.A. 264. Winter, Spring. Rec. 2. Credit 2.

508. **Methods of Teaching Adult Homemaking Classes.** (Voc. Ed. 508.) Place of Home Economics in the adult program. Organization of adult classes. Planning units of work. Observation of adult classes. Prerequisite: credit or classification in 406. Winter, Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

509. **The Home Economics Movement.** (Voc. Ed. 509.) The development of home economics in relation to the education of women. Reports of present day fields in which home economics is active. Spring. Rec. 2. Credit 2.

514. **Methods for Vocational Teachers.** (Voc. Ed. 514.) Organization of vocational program. Home projects. Teaching of related science. Prerequisite: Voc. Ed. 305. Winter, Spring Rec. 3. Credit 3.

517. **Methods in Extension and Home Demonstration Work.** Organization of home demonstration work as conducted in Iowa. Observation of various types of work with rural women and 4-H Club girls. Prerequisite: 406. Alternate years. Offered Spring, 1938. Rec. 1. Lab. as arranged. Credit 3.

605. **Home Economics Curricula.** (Voc. Ed. 605.) Survey of public school home economics curricula and recent curriculum studies. Techniques of curriculum building. Objectives and problems for specific courses. Prerequisite: credit or classification in Voc. Ed. 562. Spring. Rec. 3. Credit 3. Miss Turner.

606. **Technique of Supervision.** (Voc. Ed. 606.) Objectives, techniques, and organization of teacher training supervision and state supervision. Prerequisite: 407 or equivalent. Spring. Credit 3 to 6. Miss Friant.

607. **Survey Course in Methods for Teaching Home Economics in the Public Schools.** (Voc. Ed. 607.) Investigation and reports of present day trends in methods of teaching home economics. Prerequisite: teaching experience. Summer, first term. Rec. 5. Credit 2. Miss Miller.

610. **Seminar.** (Voc. Ed. 610.) Credit and hours as arranged. Miss Friant.

614. **Research.** (Voc. Ed. 614.) Misses Miller, Friant, Turner, Chadderdon.

HOME MANAGEMENT

FLORENCE BUSSE SMITH, Acting Head of Department

Professor Hoyt; Graduate Assistants Bergstrand, Dague, Obst, Zerwick

Extension Workers Gannon, Simmons, Simpson, Souder

The purpose of the Home Management curriculum is to give the student an appreciation of the value of good management in the various phases of home life. It offers to those who do not wish to specialize in any one field of Home Economics, a more general training. Class work and residence in one of the home management houses give opportunity for gaining some experience with the managerial and social problems of the home and the care of a child in a home situation. Special provision is made by the department for the mature student who wishes to prepare for a teaching position in Home Management.

Curriculum in Home Management

Leading to the degree of Bachelor of Science.

For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Applied Organic Chem. 264	5	Food Chemistry Chem. 266	3	Human Physiology Zool. 255	5
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Costume Design T.&C. 144	3	Food Preparation F.&N. 204	4	Food Preparation F.&N. 205	4
General Psychology Psych 204	3	Clothing T.&C. 224	3	Early 19th Century Engl. 254 or Technical Journalism T.Jl. 225B	3
House Planning A.A. 260	2	Interior House Design A.A. 264	3		
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	16		16		16

*One credit is given after the completion of three quarters' work.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
General Bacteriology Bact. 304B	5	Applied Sociology Ec. 884	3	Meal Planning F.&N. 303	4
American Government Govt. 214	3	Advanced Clothing T.&C. 324	4	Art Appreciation A.A. 484	3
Child. & Adolescence Psych. 415	3	Child Care and Training C.D. 435	3	Physical Development C.D. 545	
Plan. Home Landscapes L.A. 206	2	Textile Economics T.&C. 464	2	Extempore Speaking P.S. 311	3
Electives	3	Music Appreciation Music 144	1	Electives	3
		Electives	3		
	16		16		15

SENIOR YEAR

Home Management H.Mgt. 474	3	Home Relationships H.Mgt. 584	3	Special Problems H.Mgt. 579	1-3
Home Mgt. House H.Mgt. 475	4	Child Physiology †Zool. 558	3	Standards of Living †Ec. 516	3
Household Economics Ec. 514	3	Family Finances H.Mgt. 518	2	Electives	12-10
**Elective in English	3	Electives	9		
Electives	3				
	16		17		16

**Students who elected T.J. 225 in the Sophomore year take Engl. 254 or 255.

†Alternatives in the above sequence are as follows: L.A. 206 or Hort. 146, Home Floriculture; Zool. 558 or F.&N. 506, Nutrition of Children; Ec. 516 or Ec. 515, Consumers Marketing or Ec. 517, Housing. Suggested electives for Home Management Curriculum: Cer.E. 324; Engl. 354 or 404, 414, 455; I. A. 105; T. J. 225 or 335; Ec. 385.

For those students especially interested in the economic aspects of Home Management, the following changes are recommended: omit Music 144, C.D. 545, H.Mgt. 584, Zool. 558; and add Ec. 234 or 406, 304 or 505, 515, and H.Mgt. 517.

Description of Courses

474. **General Home Management.** The home as it is influenced by training and by expenditure of time, energy, and money; and a consideration of human values. Prerequisite: F.&N. 303, C.D. 435, Ec. 212, 384, and classification in H. Mgt. 475. Fall, Winter, Spring. Rec. 3, 2 hr. periods for six weeks, alternating with 475. Credit 3.

475, **Home Management House.** Six weeks' residence with actual experience in such phases of homemaking as food preparation, purchasing, meal planning and serving, child care, housekeeping, household finance, hospitality, and group relationships. Prerequisite: classification in 474. Reservation required previous to beginning of quarter. Fall, Winter, Spring. Credit 4 for six weeks' residence.

517. **Housing.** (Ec. 517.) Expenditures, factors affecting demand for and supply of housing, regulations pertaining to housing, house ownership, organization promoting better housing. Prerequisite: Ec. 212. Spring. Rec. 3. Credit 3.

518. **Family Finance.** (Ec. 518.) Earning and spending income to increase its adequacy and insure economic security; budgeting, accounting, consumer credit, investments, control of property. Prerequisite: credit or classification in Ec. 212. Winter, Spring. Rec. 2. Credit 2.

579 **Special Topics.** Prerequisite: 475. Fall, Winter, Spring.

584. **Home Relationships.** Relationships among family members and present day influences affecting them. Prerequisite. 474, or consent of head of department. Rec. 3. Credit 3. Winter.

614. **Research.** Miss Hoyt.

677. **Seminar.** Winter. Miss Hoyt.

684. **Supervision.** Organization, supervision and methods of conducting Home Management Houses. Prerequisite: 475. Rec. 2. Lab. 1, 3 hr. Credit 3. Fall. Mrs. Smith.

HOUSEHOLD EQUIPMENT

Louise J. Peet, Head of Department

Associate Professor Brashear; Assistant Professor Sater

The field of household equipment is one of the newer developments of home economics. Beginning as a general subject which aimed to give an understanding of the principles and techniques which the homemaker should know about the selection, operation, care, and convenient arrangement of equipment in the house, it has grown to a course preparing for both the professional and commercial fields. There is an increasing demand for trained women as home economic directors in firms manufacturing household equipment; home service directors in gas and electric companies; research workers in college and commercial laboratories; college teachers; and extension workers.

Curriculum in Household Equipment

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Applied Organic Chem 264	5	Food Chemistry Chem. 265	5	Physiol. & Nutritional Chem. Chem. 274	3
Food Preparation F.&N. 204	4	Food Preparation F &N 205	4	American Government Govt 214	3
General Physics Phys. 301	4	General Physics Phys 302	4	General Physics Phys 303	4
Costume Design T.&C. 144	3	General Psychology Psych. 204	3	House Planning A A 260	2
				Technical Journalism T Jl 225B	3
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed 223	1*
	16		16		16

*One credit is given upon the completion of three quarters' work.

JUNIOR YEAR

Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec of Consumption Ec. 213	3
Child. & Adolescence Psych. 415	3	Household Bacteriology Bact. 304B	5	Interior House Design A.A. 264	3
Human Physiology Zool. 255	5	Clothing T.&C. 224	3	Meal Planning F.&N. 303	4
Equipment Mechanics H.Eq. 404	3	Equipment Mechanics H.Eq. 405	3	Applied Sociology Ec. 384	3
Electives	3	Electives	3	Electives	3
	17		17		16

SENIOR YEAR

Nutrition and Dietetics F.&N. 305	4	Textile Economics T.&C. 464	2	Seminar H.Eq. 425	2
Art Appreciation A.A. 484	3	Child Care and Training C.D. 435	3	Home Management H.Mgt. 474	3
Experimental Cookery F.&N. 511	3	Nineteenth Century Engl. 254 or 255	3	Home Mgt. House H. Mgt.475	4
Elective in H.Eq.	3	Extempore Speaking P.S. 311	3	Electives	6
Electives	3	Electives	4		
	16		15		15

Since the curriculum in household equipment is designed to prepare the student for commercial and professional appointments, 10-15 credits are to be selected in conference with the head of the department. Subjects suggested as essential for students desiring commercial positions in equipment are business correspondence, technical advertising, feature writing, public speaking, catering, and business psychology.

Description of Courses

154. **Fundamentals of Household Equipment.** Prerequisite: Phys. 106 or equivalent. Fall, Winter, Spring. Lect. and lab. 3. 2 hr. Credit 3.

338. **Technics of Demonstration.** Selection and organization of suitable material, and practice in broadcasting and demonstrating. Open to students not majoring in household equipment. Prerequisite: F.&N 305. Summer, first term. Rec. 2 Lab. 4, 3 hr Credit 3.

404, 405. **Equipment Mechanics.** Fundamentals of electricity and of heat. Simple circuits. Operation and use of laboratory testing and measuring instruments, materials used in equipment construction; thermostats. (404) Prerequisite: 154 and credit or classification in Phys. 301, 302, or 303. (405) Prerequisite: 404. Fall, Winter, respectively. Lect. 1. Lab. 2, 3 hr. Credit 3 each course.

425. **Seminar.** Recent developments in the equipment field. Prerequisite: 405. Spring. Rec. 2 Credit 2

435. **Equipment Testing.** Use of measuring and testing instruments to determine efficiency and cost of operation of gas and electric equipment for institution use. Prerequisite. 154. Fall, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3

506. **Gas and Electric Cooking Appliances.** Construction and efficient operation of ranges and small appliances. Prerequisite 405. Spring. Lect. 1. Lab 2, 3 hr. Credit 3.

507. **Equipment for Cleaning.** Laundry equipment, vacuums, waxers, brushes. Prerequisite: 405, T.&C. 504. Winter. Lect. 1. Lab. 2, 3 hr Credit 3.

508. **Non-electric Equipment.** Types on the market, methods of manufacture, factors governing their efficiency. Prerequisite: 404. Winter. Lect 1 Lab. 2, 3 hr. Credit 3.

509. **Home Utilities.** Construction and operation of ice and mechanical refrigerators; principles of electric circuits as applied to home wiring; lighting fixtures Prerequisite: credit or classification in 404. Fall. Lect 1 Lab 2, 3 hr. Credit 3.

514. **Special Topics.** Prerequisite: 154. Fall, Winter, Spring

521, 522, 523. **Training for Home Service Directors.** Practical experience in Home Service Work. Demonstrations, preparation of publicity material, radio programs, approved business procedure. Prerequisite. 4 credits in advanced equipment. Spring, Fall, Winter, respectively. Conference 1. Lab 2, 3 hr Credit 3 each course.

604. **Seminar.** Fall, Winter, Spring Mrs Peet

614. **Research.** Mrs. Peet.

INSTITUTION MANAGEMENT

FERN W. GLEISER, Head of Department

Instructors Anderson, McMullen, Severance, Sullivan; Graduate Assistant Goethe; Fellow Sheldon

The curriculum in Institution Management is planned to prepare students for managerial positions in the field of institutional adminstration. Graduates of this department fill positions as managers of food and housing departments of clubs, hotels, and college dormitories, and direct the food service in tea rooms, restaurants, cafeterias, school lunch rooms, and college dining halls.

Experience has proved that students completing this curriculum should plan to serve a period of apprenticeship in an approved institution. An apprenticeship period of from six months to one year under the supervision of an experienced manager should be completed before the graduate accepts a position requiring managerial responsibility. It is suggested that the student spend the summer vacation following the Junior year working in either the food or housing department of an institution.

Training in large quantity food preparation and service is afforded through the Home Economics Tea Room in which luncheon is served to faculty and students, and catering is done for special occasions. The Memorial Union, through the food and room services, offers laboratory experience in management to advanced students.

Curriculum in Institution Management

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation F.&N. 204	4	Food Preparation F.&N. 205	4	Clothing T.&C. 224	3
Applied Organic Chem. 264	5	Food Chemistry Chem. 265	5	Physiol. & Nutr. Chem. Chem. 274	3
Costume Design T.&C. 144	3	House Planning A.A. 260	2	Interior House Design A.A. 264	3
American Government Govt. 214	3	General Psychology Psych. 204	3	Nineteenth Century Engl. 254 or 255	3
		Technical Journalism T.Jl. 225B	3	Extempore Speaking P.S. 311	3
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	15		17		16

*One credit will be given upon the completion of three quarters' work.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Ec. of Consumption Ec. 213	3
Human Physiology Zool. 255	5	Large Quantity Cookery I.Mgt. 380	4	Equipment Testing H.Eq. 435	3
General Bacteriology Bact. 304B	5	Meal Planning F.&N. 303	4	Nutrition and Dietetics F.&N. 305	4
Electives	3	Textile Economics T.&C. 464	2	Child. & Adolescence Psych. 415	3
		Electives	3	Electives	3
	16		16		16

SENIOR YEAR

Purchasing I.Mgt. 484	3	Institution Equipment I.Mgt. 485	3	Institution Administration I.Mgt. 587	3
Accounting Ec. 374	4	Catering I.Mgt. 486	3	Special Topics I.Mgt. 588	3
Experimental Cookery F.&N. 511	3	Home Management H.Mgt. 474	3	Applied Sociology Ec. 384	3
Child Care and Training C.D. 485	3	Home Mgt. House H.Mgt. 475	4	Art Appreciation A.A. 484	3
Electives	3	Electives	3	Business English Engl. 404	2
				Electives	2
	16		16		16

Students who plan to engage in commercial food service are advised to elect Experimental Cookery, F.&N. 512; Industrial Psychology, Psych. 464; Training for Home Service Directors, H.Eq. 521; Farm Meats, A.H. 374.

Students whose major interest is the administration of a hospital dietary department should major in Foods and Nutrition and elect I. Mgt. 380, 484, 485, and 587.

Mature students interested in the management of college residences and dining halls are advised to elect Experimental Cookery, F.&N. 512; Diet in Disease, F.&N. 504; Training for Home Service Directors, H.Eq. 521; Gas and Electric Cooking Appliances, H.Eq. 506; and further work in Economics and Psychology. If the student plans to teach institution management, she should elect Methods of Teaching College Subjects, Voc.Ed. 561, 562, 563.

Description of Courses

380. **Large Quantity Cookery.** Standard methods of food production in quantity; menu planning for institutions; food cost accounting; experience in food service. Prerequisite: F.&N. 207. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

484. **Purchasing.** Factors determining the selection of foods and general supplies. Methods of buying. Prerequisite: 380. Fall. Rec. 2. Lab. and rec. 1, 2 hr. Credit 3.

485. **Institution Equipment.** Selection, arrangement and care of equipment and furnishings for the food and housing department. Prerequisite: 380, H. Eq. 435. Winter. Rec. 2. Lab. and rec. 1, 2 hr. Credit 3.

486. **Catering.** Food preparation and service for special occasions. History of cookery. Contribution of foreign nations to the American cookery of today. Prerequisite: 380, credit or classification in F.&N. 303. Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

580. **Experimental Quantity Cookery.** Methods in quantity food production as related to the time factor, institution equipment, and proportions of ingredients. Prerequisite: 380, F.&N. 511. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

587. **Institution Administration.** Principles of scientific management applied to institutional administration. Emphasis on forms of business organization, employer and employee relationship, and keeping of records. Prerequisite: 484 or 485. Spring. Rec. 3. Credit 3.

588. **Special Topics.** Observation and practical experience in the food service and housing departments of selected institutions. Study of a particular managerial problem. Prerequisite: 484, 485, 486. Fall, Winter, Spring.

604. **Seminar.** Miss Gleiser.

614. **Research.** Miss Gleiser.

TEXTILES AND CLOTHING

ROSALIE RATHBONE, Head of Department

Professors Brandt, Cranor, Sims; Associate Professors Settles, Stephens; Assistant Professor Potgieter; Instructors Buchanan, Gabrielson, Meyer, Teter; Extension Workers Adams, Brown, Peterson

The department of Textiles and Clothing has for its aim the furnishing of such knowledge and training as it believes essential for the consumer in order that she may intelligently provide clothing and household fabrics for her family and her home. It further aims to prepare students for the teaching of clothing in schools, colleges, and extension divisions; to provide a background for merchandising and other commercial positions; and endeavors to stimulate interest in investigations and research in this field. Work is offered in textiles, textile economics, design, selection and construction of clothing.

Curriculum in Textiles and Clothing

Leading to the degree of Bachelor of Science.
For Freshman year, see page 194.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Applied Organic Chem. 264	5	General Psychology Psych. 204	3	Ec. of Consumption Ec. 213	3
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	Textile Analysis Chem. 268	5
Drawing & Composition A.A. 221	2	Drawing & Composition A.A. 222	2	Food Preparation F.&N. 205	4
Costume Design T.&C. 144	3	Clothing T.&C. 224	3	Interior House Design A.A. 264	3
American Government Govt. 214	3	Food Preparation F.&N. 204			
		House Planning A.A. 260	2		
Physical Education Phys.Ed. 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	16		17		16

*One credit will be given upon the completion of three quarters' work.

JUNIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Meal Planning F.&N. 303	4	Household Bacteriology Bact. 304B	5	Child Care and Training C.D. 435	3
Child. & Adolescence Psych. 415	3	Early 19th Century Eng. 254	3	Mid 19th Century Engl. 255	3
Advanced Clothing T.&C. 324	4	Costume Design T.&C. 444	3	Applied Sociology Ec. 384	3
Advanced Textiles T.&C. 504	3	Textile Design A.A. 434	3	Adv. Composition Engl. 304 or Technical Journalism T.Jl. 225B	3
*Electives	3	*Electives	3	*Electives	3
	17		17		15

SENIOR YEAR

Art Appreciation A.A. 484	3	Home Management H.Mgt. 474	3	Extempore Speaking P.S. 311	3
History of Costume T.&C. 554	3	Home Mgt. House H.Mgt. 475	4	Applied Dress Design T.&C. 525	3
Textile Economics T.&C. 464	2	Historic Textiles T.&C. 514	3	Costume Design T.&C. 544	3
Applied Dress Design T.&C. 524	3			Textile Economics T.&C. 565	2
*Electives	5	*Electives	5	*Electives	4
	16		15		15

*Nine credit hours of electives must be chosen from the major or closely related departments.

Curriculum in Textiles and Textile Chemistry

For students who wish to prepare for research in Textile Chemistry a special arrangement of courses is provided which will give a combination of Textiles and Clothing and Chemistry. The curriculum is similar to that prescribed in the first year in the curriculum in Textiles and Clothing but will require some substitution of chemistry courses in the Sophomore year and the use of electives in Physics and Mathematics. In the Junior and Senior years advanced work in chemistry and textiles will be required. This and other sequences may be arranged under the direction of the head of the department.

	Credits
Freshman—Substitute for Phys. 106 (4) Chem. 103	4
Substitute for Hist. 211, 212, 213, (9) Math. 101 102A, 103	15
Sophomore—Substitute for Chem. 268 (5) Chem. 211, 212, 213.	11
Omit—A.A. 264 (3).	
Junior—Chem. 331, 332, 333	12
Phys. 301, 302, 303	12
Math. 211, 212, 213	12
Senior—Chem. 321, 322, 323	12
Chem. 466, 565	8
Mod.Lang. 441, 442, 443	9
Omit—H.Mgt. 475	

Description of Courses

104. **General Textiles.** Fundamental weaves, yarns, fibres, color, and finishes with reference to selection of fabrics for clothing and house. Fall, Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3.

144. **Costume Design.** The essentials of designing and selection of costumes for the individual. Based on personal design, line, color, individual and figure problem. Prerequisite: A.A. 105. Fall, Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3.

224. **Clothing.** Designing and making patterns of dress and details by modeling and draping; fitting and construction to evaluate individual sewing skills. Prerequisite: 144. Fall, Winter, Spring. Lab. 3, 3 hr. Credit 3.

225. **Independent Work.** Students will be required to plan and complete a clothing problem after the completion of 224 and pass an examination before registration in 324.

324. **Advanced Clothing.** Development of the foundation pattern; flat pattern designing and the selection and construction of a wool garment. Prerequisite: 224, 225. Fall, Winter, Spring. Lect. and lab. 3, 3 hr. Credit 4.

444. **Costume Design.** Creative problems based on source material commonly used in designing clothing. Prerequisite: 224. Fall, Winter. Lect. and lab. 3, 2 hr. Credit 3.

464. **Textile Economics.** Economic phases of the production and distribution of textile and clothing commodities which directly or indirectly affect the consumer. Prerequisite: 104, 224, Ec. 213. Fall, Winter, Spring. Rec. 2. Credit 2.

504. **Advanced Textiles.** Specific studies of different groups of clothing and household textiles in relation to modern practical needs. Prerequisite: 104 and classification in 324, or equivalent. Fall, Winter. Lect. and lab. 3, 2 hr. Credit 3.

514. **Historic Textiles.** Development of textiles from ancient times; existing sources compared with modern commercial products. Development of appreciation with reference to materials, old or new. Prerequisite: 104, Hist. 213. Winter, Spring. Lect. and lab. 3, 2 hr. Credit 3.

524, 525. **Applied Dress Design.** (524) Draping and modeling dresses of original designs with emphasis upon the technique of the handling of different fabrics and the finishing techniques. Prerequisite: 324, 444. Fall, Winter. Lect. and lab. 3, 3 hr. Credit 3. (525) Pattern requirements of designs in different materials and different types of costumes. Prerequisite: 524. Spring. Lect. and lab. 2, 3 hr. Credit 3.

526. **Children's Clothing.** Selection and construction of suitable clothing for children. Prerequisite: 324. Winter, Spring. Lect. and lab. 2, 3 hr. Credit 3.

527. **Tailoring.** Tailored construction applied in the making of coats and suits. Prerequisite: 324. Winter. Lab. 2, 3 hr. Credit 2.

544. **Costume Design.** Selection and creative work in ensemble building with emphasis upon detail. Prerequisite: 444, 524, 554. Spring. Lect. and lab. 3, 2 hr. Credit 3.

545. **Costume Selection.** Selection of ready-to-wear clothing and accessories, with emphasis on appropriate use and value. Prerequisite: 464. Spring. Lect. and lab. 2, 2 hr. Credit 2.

554. **History of Costume.** Prerequisite: History 213. Fall. Lect. 3. Credit 3.

565. **Textile Economics.** Prerequisite: 464. Spring. Credit 2.

590. **Special Topics.** Prerequisite: 324. Fall, Winter, Spring. Credit 2 to 4.

610. **Seminar.** Fall, Winter, Spring. Miss Rathbone, Miss Cranor.

614. **Research.** Misses Rathbone, Cranor, Brandt, Settles.

Curriculum in Home Economics with Major in Technical Journalism

A variety of positions is open to women with combined training in home economics and technical journalism. Such positions fall into two classes, editorial and advertising. The first class includes editorial work or free lance writing for women's magazines, farm journals, daily papers and syndicates. The second class includes advertising and publicity positions with magazines and with industries associated with the home.

Students in home economics with a major in technical journalism have opportunity for practical experience through work on campus publications including The Iowa Homemaker, published by home economics students. Many young women also lay a foundation for active careers by contributing to magazines and newspapers during their training.

Leading to the degree of Bachelor of Science.

For Freshman year, see page 194.

For Technical Journalism, see page 258.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Food Preparation F.&N. 204	4	Costume Design T.&C. 144	3	Food Preparation F.&N. 205	4
Applied Organic Chem. 264	5	Food Chemistry Chem. 266	3	House Planning A.A. 260	2
Principles of Economics Ec. 211	3	Principles of Economics Ec. 212	3	General Psychology Psych. 204	3
Electives	3	Clothing T.&C. 224	3	Ec. of Consumption Ec. 213	3
		American Government Govt. 214	3	Early 19th Century Engl. 254	3
Physical Education Phys.Ed 221	R	Physical Education Phys.Ed. 222	R	Physical Education Phys.Ed. 223	1*
	15		15		16

*One credit will be given upon the completion of three quarters' work.

JUNIOR YEAR

Technical Writing T.Jl. 221	4	Technical Writing T.Jl. 222	4	Technical Writing T.Jl. 223	4
General Bacteriology Bact. 304B	5	Applied Sociology Ec. 384	3	Child Care and Train'ng C.D. 435	3
		Child Psychology Psych. 415	3	Meal Planning F.&N. 303	4
		Interior House Design A.A. 264	3	Extempore Speaking P.S. 311	3
Electives	6	Electives	3	Electives	3
	15		16		17

SENIOR YEAR

Technical Writing T.Jl. 321	3	Technical Writing T.Jl. 322	3	Art Appreciation A.A. 484	3
Practice Copy Editing T.Jl. 341	2	Practice Copy Editing T.Jl. 342	2	Practice Copy Editing T.Jl. 343	2
Home Management H.Mgt. 474	3			Textile Economics T.&C. 464	2
Home Mgt. House H.Mgt. 475	4				
Electives	5	Electives	12	Electives	9
	17		17		16

HORTICULTURE AND FORESTRY

For information concerning the Division of Agriculture, see page 58.

This department includes these major lines of work:

FORESTRY. See page 180.

HORTICULTURE. See page 216.

HORTICULTURE

B. S. PICKETT, Head of Department

Professors Erwin, Maney, Richey, Volz; Associate Professors Nichols, Schilletter; Assistant Professors Haber, Lantz, Plagge

Extension Workers Fitch, Holsinger, Edgecombe

It is the aim to teach in a logical way the fundamental principles underlying horticultural practice, supplement this freely with demonstrations, and bring the student into contact with the practical operations. The technical courses are well supported by work in fundamental science and cultural courses.

Directly connected with the campus are orchards, nurseries, vineyards and gardens. The department has a well equipped plant laboratory building together with greenhouses having over 30,000 feet under glass Thus the department is able to furnish good opportunities for the student in horticulture to become acquainted with various horticultural operations as carried on under glass and in the field.

There are good openings for horticultural graduates in fruit growing, truck farming, floriculture, managing and superintending commercial fruit, flower, and vegetable establishments. Positions are also open for managers of co-operative associations, for teachers in colleges, academies, and high schools, and for extension experts in agricultural colleges, railroads, land companies, and horticultural associations. Government and experiment station lines of work also afford desirable employment.

Curriculum in Horticulture

Leading to the degree of Bachelor of Science.
For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Horticulture Hort. 114[1]	3	Greenhouse Management Hort. 154	3	Vegetable Growing Hort. 164B	3
General Botany Bot. 101	3	General Botany Bot. 102	3	Systematic Botany Bot. 206	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
*Livestock Problems A.H. 101	2	Mathematics Math. 205	4	*Livestock Problems A.H 103	2
Military 121	1	Military 122	1	Military 123	1
	16		18		17

*Students in Floriculture and Nursery Management may substitute for courses in Animal Husbandry.

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall), Hort 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

[1]The number refers to the description of the course
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Principles of Economics Ec. 201	3	Principles of Economics Ec. 202	3	Grapes and Small Fruits Hort. 224	4
Plant Physiology Bot. 205	4	Plant Propagation Hort 214	3	Garden Flowers Hort. 244	3
Soils Soils 254	3	Horticultural Machinery A E. 238	3	Farm Dairying D.I. 114	4
Organic and Quantitative Chem. 255	3	Fertility and Fertilizers Soils 354	5	Extempore Speaking P.S. 311	2
Crop Production F.C. 104	4	Applied Organic Chem. 258	2	Physics Phys. 204	3
Military 221	1	Military 222	1	Military 223	1
	18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202 203.

JUNIOR YEAR

At the beginning of the Junior year, the student must choose a major in Pomology, Floriculture, Nursery Management, or Vegetable Crops. For Majors see below.

Orcharding Hort. 521	3	Orcharding Hort. 522	3	Orcharding Hort 523	3
Economic History Hist. 324	3	General Bacteriology Bact. 304A	5	American Government Govt. 315	3
General Genetics Gen. 300	3	Gen. Landscape Design L.A. 208	3	Plant Pathology Bot. 207	4
Genetics Laboratory Gen 305	1	Elementary Accounting Ec. 370	3		
Elementary Entomology Zool. 274	4				
Electives	3	Electives	3	Electives	7
	17		17		17

SENIOR YEAR

Seminar Hort. 401	1	Seminar Hort. 402	1	Seminar Hort. 403	1
Horticultural Problems Hort. 411	2	Horticultural Problems Hort. 412	2	Horticultural Problems Hort. 413	2
Elective in English	3	History & Lit. of Hort. Hort. 514	3		
Electives	11	Electives	11	Electives	14
	17		17		17

Majors in Horticulture*

POMOLOGY

Students desiring to major in Pomology are required to take the following courses during their Junior and Senior years: Commercial Vegetable Crops, Hort. 366, 3 credits; Marketing Horticultural Products, Hort. 414, 3 credits; Systematic Pomology, Hort. 524, 3 credits; Exotic Fruits, Hort. 424, 2 credits; Fruit Farm Management, Hort. 426, 3 credits; Inspection Tours, Hort. 301, required; Fruit Pests, Zool. 375, 5 credits; Commercial Floriculture, Hort. 546, 3 credits.

*The curriculum in Horticulture offers a considerable number of free electives in the junior and senior years. It is suggested that each student prepare a sequence of desirable electives leading to a definite objective, as for example a group of courses preparing him to teach agriculture in high school, or a group in History, Economics, English, Religious Education, Botany, Entomology, Chemistry, Poultry, Soils, or one of the other majors in Horticulture.

FLORICULTURE

Students desiring to major in Floriculture are required to take the following courses during their Junior and Senior years: Greenhouse Construction, Hort. 246, credit 3; Commercial Vegetable Crops, Hort. 366, 3 credits; Commercial Floriculture, Hort. 546 and 547, 6 credits; Floriculture Practice, Hort. 341, 342 and 343, 3 credits; Conservatory Plants, Hort. 444, 3 credits; Floral Arrangement, Hort. 344, 3 credits; Vegetable Forcing, Hort. 468 and 469, 4 credits; Greenhouse Pests, Zool. 378, 2 credits; Inspection Tours, Hort. 301, required; Plant Materials, L.A. 231 and 232, 5 credits.

VEGETABLE CROPS

Students desiring to major in Vegetable Crops are required to take the following courses during their Junior and Senior years: Commercial Vegetable Crops, Hort. 366, 3 credits; Systematic Olericulture, Hort. 464, 3 credits; Vegetable Crops Practice, Hort 364 and 365, 2 credits; Inspection Tours, Hort. 301, required; Vegetable Forcing, Hort. 468 and 469, 3 credits; Commercial Floriculture, Hort. 546, 3 credits; Greenhouse Pests, Zool. 378, 2 credits.

NURSERY MANAGEMENT

Students desiring to major in Nursery Management are required to take the following courses during their Junior and Senior years: Taxonomy of Horticultural Plants, Hort. 525, 526, 527, credit 9; Nursery Methods, Hort. 316, credit 3; Maintenance, Hort. 315, credit 3; Plant Materials, L.A. 231, 232, 333, credit 8; Money and Banking, Ec. 304, credit 3; Business Law, Ec. 365, credit 3.

Description of Courses

110. **Introduction to Horticulture.** To acquaint first year students with the field of horticulture and to assist them in learning how to use the facilities of the College and the department to advantage. Spring. Lect. 1. Required.

114. **General Horticulture.** For Agricultural students. A discussion of the field of horticulture, limiting factors in production of horticultural crops; propagation, planting and training, soil management, blossom bud formation, pollination, storage, and pruning. Fall, Winter, Spring. Lect. 2. Rec. and lab. 1, 3 hr. Credit 3.

146. **Home Floriculture.** Principles and methods of growing house plants and garden flowers and arrangement of cut flowers in the home. Fall, Spring. Lect. and lab. 2, 2 hr. Credit 2.

154. **Greenhouse Management.** Principles and methods of plant growing under glass. Winter. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3.

164A, 164B. **Vegetable Crops.** Areas of production and culture of the more important vegetable crops. Special emphasis is given to the potato. (A) Fall, Spring. Lect. 2. Credit 2. (B) Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

214. **Plant Propagation.** Fundamental principles underlying the sexual and asexual propagation of plants and practice in reproducing plants by the use of seeds, leaves, stems, or roots. Prerequisite: 114. Winter. Lect. 2. Rec. and lab. 1, 3 hr. Credit 3.

224. **Grapes and Small Fruits.** Principles and practices involved in handling home and commercial plantings of grapes, raspberries, blackberries, gooseberries, currants, and strawberries. Prerequisite: 114 or 214. Spring. Lect. 3. Rec. and lab. 1, 3 hr. Credit 4.

244. **Garden Flowers.** Description, nomenclature, classification, and culture of important garden flowers including annuals, perennials, bulbs, flowering vines, rock and water garden plants. Prerequisite: Botany 101 or equivlent. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

246. **Greenhouse Construction.** Various types of greenhouses; principles and methods of heating; preparation of plans and specifications for commercial and private ranges. Fall. Lect. 1. Lect. and lab. 2, 2 hr. Credit 3.

301. **Inspection Tours.** Required of Horticultural students during Junior or Senior year. Depending on the major line of work, the student will visit fruit growing, vegetable crops, floriculture and nursery establishments under the personal direction of an instructor and make a formal written report of the trip These trips will require from four to ten days depending on the places visited. Time to be arranged. Required, but requirement may be met by electing Hort. 501.

314. **General Horticulture.** For teachers. Survey of the field of horticulture. Literature, materials, laboratory exercises and practice. Summer. Lect. 4. Lab. 2, 3 hr. Credit 3.

315. **Maintenance.** Care of lawns, shade trees, ornamental shrubs, fruit, vegetable and flower gardens, walks, drives, and garden accessories. Spring. Lect. 2. Demonstration and lab. 1, 3 hr. Credit 3.

316. **Nursery Methods.** Equipment, including land, packing sheds, storage sheds, frames, glass houses, irrigation devices; large scale propagation; transplanting and management of plants; relations to other fields of horticulture; protection of nursery plants from climatic, disease and insect difficulties. Spring. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3.

318. **Horticultural Crops for Iowa Farms.** Production, storage and marketing of those horticultural crops which can be used profitably to supplement incomes on large farms or as principal sources of revenue on small farms. Prerequisite: 114. Fall. Lect. 2. Rec. 1. Credit 3.

324. **Fruit Judging.** Identification and judging of fruits with special emphasis on the apple. Prerequisite: 114 or equivalent. Fall. Lab. 1, 2 hr. Credit 1.

341, 342, 343. **Floriculture Practice.** Principles of and actual practice in greenhouse fumigation; light demands and light control for plants; humidity regulation; feeding plants; improved methods of plant and cut flower merchandising. Seasonable laboratory assignments supplementing other laboratory work in floriculture. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.

344. **Floral Arrangement and Judging.** Principles and methods of cut flower arrangement and design; interior decoration; exhibiting and judging flowers and plants. Prerequisite: 154 or 244. Enrollment limited to 10 students. Spring. Lect. 1. Lect. and lab. 2, 2 hr. Credit 3.

364, 365. **Vegetable Crops Practice.** Practical work in truck crops and market gardening. Prerequisite: 164. (364) Spring. Lab. 1 to 3, 3 hr. Credit 1 to 3. (365) Fall. Lab. 1, 3 hr. Credit 1.

366. **Commercial Vegetable Crops.** Production of crops on a commercial scale in truck farming and market gardening. Lect. 2. Lab. 1, 3 hr. Credit 3. Prerequisite: 164. Spring.

401, 402, 403. **Seminar.** Fall, Winter, Spring respectively. Credit 1 each course.

411, 412, 413. **Horticultural Problems.** Special investigation for undergraduate students. Special report required. Fall, Winter, Spring, respectively. Credit 2 each course.

414. **Marketing Horticultural Products.** Areas of production of horticultural crops standardization, inspection, transportation, storage, price trends, agents of distribution, market news service, foreign markets, co-operative markets. Prerequisite: 114. Alternate years. Offered Winter, 1938. Lect. 2. Conf. 1. Credit 3.

424. **Exotic Fruits.** The propagation, growing, shipping, and selling of tropical and subtropical fruits are discussed. Alternate years. Offered Winter, 1937. Lect. 2. Credit 2.

426. **Fruit Farm Management.** The total, prorated and percentage costs of the various operations involved in growing a commercial apple orchard and producing a bushel of apples. Prerequisite: 521 or equivalent. Fall. Lect. 2. Rec. and lab. 1, 3 hr. Credit 3.

444. **Conservatory Plants.** Identification, classification, propagation and culture of palms, ferns, orchids, begonias and other greenhouse exotics. Prerequisite: 154. Winter. Lect. 2. Lab. 1, 3 hr. Credit 3.

464. **Systematic Olericulture.** History and classification of vegetable groups, types, and varieties; vegetable exhibits and judging. Prerequisite: 164. Fall. Lect. 2. Lect. and lab. 1, 2 hr. Credit 3.

466. **Truck Farm Management.** Special emphasis is placed on grading and marketing, as well as on labor saving machinery for production of vegetable crops on a commercial scale. Prerequisite: 164. Alternate years. Offered Winter, 1937. Lect. 1. Rec. 1. Credit 2.

468, 469. **Vegetable Forcing.** Management and culture of vegetables under glass. (468) Prerequisite: 164. Winter. Lect. 1. Lab. 1, 2 hr. Credit 2. (469) Prerequisite: 468. Spring. Lect. 1. Lect. and lab. 1, 2 hr. Credit 2.

501. **Travel Study.** Conducted in alternate years as follows: (1) through the principal horticultural regions of the eastern part of the United States and Canada and (2) through the principal horticultural regions of the western part of the United States. Outstanding examples of floriculture, fruit growing, truck farming, greenhouse management, nursery management, public parks and experiment stations, will be visited. Reports in regular classroom and laboratory style will be required. First or second summer session as arranged. Credit 8.

514. **History and Literature of Horticulture.** Origin of horticultural plants and practices. Prehistoric evidences of horticultural operations. Early historic references to the arts of gardening. Greek and Roman authors. Development of European and American literature of horticulture. Winter. Lect. 3. Credit 3.

516. **Storage of Horticultural Products.** Control and measurement of temperature, humidity, and ventilation in fruit, vegetable, flower, and plant storages; principles and types of refrigeration; pre-cooling; changes in product in storage. Alternate years. Offered Winter, 1937. Lect. 1. Lab. 1, 3 hr. Credit 2.

518. **Breeding of Horticultural Plants.** Status; progress; application of the principles of genetics to improvement of horticultural crops Prerequisite: Gen. 300. Alternate years. Offered Fall, 1936 Rec. and lab. 2, 2 hr. Credit 2.

521, 522, 523. **Orcharding.** Pomological regions, propagation, planting, varieties, culture, fertilization, pollination, pruning, winter injury, protection from insects and diseases, thinning, harvesting, grading, packing, storage, and by-products. Prerequisite: 114 Fall, Winter, Spring, respectively. Lect. 2. Rec. and lab. 1, 2 hr. Credit 3 each course.

524. **Systematic Pomology.** Description, nomenclature, and classification of native and sub-tropical fruits; critical descriptions and identifications with special reference to relationship and classification of varieties. Prerequisite. 114. Fall. Lect 2. Lab. 2, 2 hr. Credit 3.

525, 526, 527, 528. **Taxonomy of Horticultural Plants.** Identification, description, and classification of horticultural plants Prerequisite: Bot. 594. (525) Fruits. Fall Lect. 2. Lect. and lab 1, 2 hr. Credit 3 (526) Greenhouse ornamentals Winter. Lect 2 Lab 1, 3 hr Credit 3 (527) Outdoor ornamentals Spring Lect 2. Rec and lab. 1, 2 hr Credit 3 (528) Vegetable crops. Summer, second term Lect. 4. Lect. and lab. 2, 2 hr. Credit 3.

546, 547. **Commercial Floriculture.** (546) Culture and propagation of florist bench crops and potted plants. Prerequisite: 154, 244. Fall. Lect. 2 Lab. 1, 3 hr Credit 3 (547) Culture of tender bedding plants; marketing cut flowers, organization and management of greenhouses and the retail store. Prerequisite: 546. Winter. Lect. 2. Lect. and lab. 1, 2 hr. Credit 3.

564 **Canning Crops.** Production of canning crops, study of seed strains, seed production, acreage contracts, grading. Prerequisite: 164. Fall. Lect 2. Lab. 1, 3 hr. Credit 3.

600 **Research.** Messrs. Pickett, Erwin, Maney, Richey, Schilletter, Volz, and Haber.

601, 602, 603. **Experimental Horticulture.** (601) Principles of research as applied to horticulture Fall Rec. 3. Credit 3. Mr. Richey. (602) Methods, equipment and technique in horticultural research. Winter. Rec. and lab. 3, 2 hr. Credit 3 Mr. Richey (603) Organization, support, training, publication and relationships in horticultural research. Spring. Lect. 3. Credit 3. Mr. Pickett.

604. **Graduate Conference.** Fall, Winter, Spring. Credit 1 each quarter. Mr. Pickett.

HYGIENE

J. F. Edwards, Head of Department

Assistant Professors Goulding, Grant, Kalar, Schanche

For information concerning the Division of Industrial Science, see page 69.

For the Student Health Service of the department, see page 30.

The purpose of this department is to conserve and improve the health of students while in college and to give them such training and instruc-

tion as will enable them to maintain high health standards for themselves and for the community, after leaving college.

Hygiene instruction is given all first year women in industrial science and home economics.

Description of Courses

104. **Health Education.** Required of all women students. The principles of healthful living both individually and as applied to the home group. Fall, Winter, Spring. Lect. and rec. 3. Lab. 1, 2 hr. Credit 2 or 3. (Administered by the Department of Hygiene and the Division of Home Economics.)

404. **Applied Hygiene.** For those who wish to have a practical knowledge of health principles and their application to themselves, to the community and to their vocation. Special emphasis is given to school and industrial hygiene Spring. Lect. 2 Lab 1, 3 hr. Credit 3.

INDUSTRIAL ARTS

WILLIAM L. HUNTER, Head of Department

Professor Lynn; Assistant Professors Livingston, Schmidt

The purpose of the curriculum in Industrial Arts is to offer an adequate training program for teachers of manual training in Iowa. Its aim is to prepare teachers for junior and senior high schools, and for the schools in the smaller communities; and to train for high grade related subjects, teachers and administrators in vocational and industrial schools, especially those established under the Smith-Hughes Act.

An examination of the outline of the Industrial Arts curriculum will show a fairly well balanced program of courses in laboratory work, drawing, mathematics, English, sciences, and education. The special courses connected with the problems of Industrial Arts teaching are deferred to the latter part of the curriculum. Not infrequently requests come from schools for men who are prepared to teach two kinds of subjects—such as Industrial Arts and Coaching, Industrial Arts and Agriculture, Industrial Arts and Mathematics, Industrial Arts and Sciences, etc.

The technical part of the course is given in classes of the Engineering Division. The basic courses in education are given by the Department of Vocational Education. Graduation from this curriculum will entitle the student to a standard secondary certificate in Iowa, without examination. This will also secure a teacher's certificate in most of the other states.

Curriculum in Industrial Arts

Leading to the degree of Bachelor of Science.

For graduate work, see page 96.

For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	General Chemistry Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Elementary Woodwork I.A. 106	3
Drawing and Projection Engr. Dr. 131	2	Theory of Proj. Draw. Engr. Dr. 132	3	Ornamental Concrete I.A. 107	2
Engineering Problems Gen.E. 104	1	Engineering Problems Gen.E. 105	1	Freehand Drawing Arch.E. 114	1
				American Government Govt. 214	3
Military 101 or 121	1	Military 102 or 122	1	Military 103 or 123	1
	16		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106C (Winter); Engr. 114, 115.

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Woodfinishing I.A. 105	2	Advanced Woodwork I.A. 205	3	Ornamental Metalwork I.A. 104	3
Metal Shop M.E. 233	3	Elem. Teaching Problems I.A. 110	3	Carpentry I.A. 155	2
Mechanics and Heat Phys. 211	4	Elect. and Magnetism Phys. 212	4	Sound and Light Phys. 213	4
Expository Writing Engl. 204	2	Metal Casting M.E. 237	4	Freehand Drawing Arch.E. 115	1
General Psychology Psych. 204	3	Beginning Tech. Jl. T.Jl. 225A	2	Heat Treat. of Metals M.E. 238	4
Engineering Econonics Ec. 261	3			Industrial History of U. S. Hist. 235	3
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	18		17		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Applied Sociology Ec. 384	3	Methods of Teaching Voc.Ed. 305	4	Industrial Sociology Ec. 480	3
Industrial Arts Design I.A. 305	2	Care of Equipment I.A. 306	2	Electrical Construction I.A. 304	2
Principles of Education Voc.Ed. 304	3	Trade Analysis I.A. 318	3	General Shop I.A. 406	2
Hand Made Pottery Cer.E. 324	2	House Design Arch.E. 234	2	Psych. of Employment Psych. 438	2
Soc. Signif. Industrial Ed. I.A. 317	3	Psych. of Motivation Psych. 335	3	Shop Planning I.A. 309	3
Extempore Speaking P.S. 311	2			Tech. of Teaching Trades I.A. 510	3
*Electives	3	*Electives	3	*Electives	3
	18		17		18

SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Industrial Occupations I.A. 504	3	Organ. Adm. Ind. Arts I.A. 405	3	Found. of Indus. Educa. I.A. 408	3
History of Industrial Arts I.A. 404	3	Commercial Woods For. 488	3	Industrial Relations Ec. 406	3
Teaching Industrial Arts I.A. 515	3	Teaching Industrial Arts I.A. 516	3	Photography Phys. 316	3
Principles of Sec. Educa. Voc.Ed. 306	3	Mental Tests Psych. 434	3	Psychology of Learning Psych. 334	3
*Electives	6	Business Law Ec. 365	3	Applied Hygiene Hyg. 404	3
		*Electives	3	*Electives	3
	18		18		18

*Electives are chosen in consultation with the head of the department. Opportunity is given to elect courses in agriculture, physical education, mathematics, etc. Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives of the Junior or Senior year.

Description of Courses

104. **Ornamental Metalwork.** The use of metal in the construction of useful household articles; peening, twisting, forming, bending, and riveting. Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

105. **Woodfinishing.** Filling, staining, waxing, varnishing, and enameling; refinishing of furniture. Fall. Lab. 2, 3 hr. Credit 2.

106. **Elementary Woodwork.** Care and adjustment of tools, elementary tool operations, construction of simple projects. Spring. Rec. 1. Lab. 3, 2 hr. Credit 3.

107. **Ornamental Concrete.** Mixing, pouring, and curing of concrete; the construction of useful articles of garden furniture. Spring. Lab. 2, 3 hr. Credit 2.

110. **Elementary Teaching Problems in Industrial Arts.** Objectives, organization, methods, projects and equipment. The object of this course is to furnish a foundation for teaching the industrial arts. Winter. Rec. 3. Credit 3.

155. **Carpentry.** (A.E. 155) Elements of building construction; care and use of carpenters' tools. Spring. Lab. 2, 3 hr. Credit 2.

204. **Woodturning.** The use of the woodturning lathe in the making of useful furniture. Winter. Lab. 2, 3 hr. Credit 2.

205. **Advanced Woodwork.** Cabinet making and joinery; use of power tools and machinery. Prerequisite: 106. Winter. Rec. 1. Lab. 3, 2 hr. Credit 3.

304. **Electrical Construction.** Winding of motors, making of battery chargers, wiring bell circuits, construction of transformers and other useful electrical apparatus. Spring. Lab. 2, 3 hr. Credit 2.

305. **Industrial Arts Design.** Proportion, balance, harmony, and gracefulness in the design of shop projects; period furniture. Prerequisite: senior college classification. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

306. **Care of Equipment.** Saw filing, band saw brazing, setting jointer knives, splicing of belts, etc. Winter. Lab. 2, 3 hr. Credit 2.

309. **Shop Planning.** Planning of school shops; selection and location of equipment; estimate of cost. Prerequisite: Senior college classification. Spring. Rec. 3. Credit 3.

317. **Social Significance of Industrial Education.** (Voc. Ed. 317.) The social influences bearing on industrial education and the reaction of this form of education on society itself. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

318. **Trade Analysis.** (Voc. Ed. 318.) Basic types of analyses. Preparation of instruction sheets for teaching trade subjects. Prerequisite: Senior college classification. Winter. Rec. 3. Credit 3.

404. **History of Industrial Arts.** An historical background of the present development of the industrial arts, essential to an understanding and appreciation of present problems. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

405. **Organization and Administration of Industrial Arts.** Supervision, organization, purchase of supplies, development of subject matter. Prerequisite: 110. Winter. Rec. 3. Credit 3.

406. **General Shop.** Construction of general shop projects; organization and methods of presentation suitable for the junior high school. Spring. Lab. 2. 3 hr. Credit 2.

408. **Foundations of Industrial Education.** (Voc. Ed. 408.) Development of the movement; the Smith-Hughes Act, state plans, and laws relating to industrial education. Spring. Rec. 3. Credit 3.

504. **Industrial Occupations.** Growth and development of important industries; statistics and trends in industry. For the teacher, counselor, and guide of adolescent pupils. Prerequisite: Psych. 438. Fall. Rec. 3. Credit 3.

510. **Technique of Teaching Trades.** (Voc. Ed. 510.) The teaching processes, methods of presentation and testing, lesson planning, organization for instruction. Spring. Rec. 3. Credit 3.

515, 516. **Teaching Industrial Arts.** (Voc. Ed. 515, 516.) Curricula, observation, supervised teaching, demonstrations, organization, and administration. Prerequisite: Voc. Ed. 305 or equivalent. Fall, Winter, respectively. Rec. and lab. 3. Credit 3 each course.

518. **Problems in Industrial Education.** (Voc. Ed. 518.) Administration and supervision of industrial education programs in public schools. Spring. Rec. 3. Credit 3. Mr. Baird.

524. **Industrial Conference Methods.** (Voc Ed. 524.) Use of the conference method in instruction. Study and practice of conference procedure, devices, and technique. Prerequisite: industrial or industrial teaching experience. Summer. Rec. 6. Credit 3. Mr. Baird.

525. **Problems in Part-Time Education.** (Voc. Ed. 525.) Demands upon supervisors, principals, teachers, and co-ordinators working in the field of part-time schools for employed minors. Winter. Rec. 3. Credit 3. Mr. Hunter.

600. **Problems in Industrial Arts Education.** (Voc. Ed. 600.) Summary of recent findings of research, methods of attack on new problems. Fall. Rec. 3. Credit 3. Mr Hunter.

605. **Tests and Measurements in Industrial Arts.** Special application of tests and measurements technique to the industrial arts. Prerequisite: Psych. 434, or equivalent Winter. Rec. 3. Credit 3. Mr. Hunter.

607. **Problems in Organization.** Typical problems in shop layouts and curricula for industrial arts in representative communities. The general shop, its purpose and organization. Spring. Rec. 3. Credit 3. Mr. Hunter, Mr. Livingston.

608. **Advanced Teaching Problems in Industrial Arts.** (Voc. Ed. 608.) Supervision, teaching, and promotion of industrial arts, including a study of successful systems now in use. Prerequisite: Undergraduate major or minor in education or psychology. Summer. Rec. 6. Credit 3. Mr. Hunter.

609. **Historical Research in Industrial Education.** (Voc. Ed. 609.) Original sources for historical research, individual problems, appreciation of the historical foundation of industrial education, significant movements in Europe and America Alternate years. Offered Summer, 1937. Rec. 6. Credit 3. Mr. Livingston

610. **Analysis and Organization of Written Instruction.** Construction and method of use of instruction sheets. Spring. Rec. 3. Credit 3. Mr. Livingston.

614. **Objectives of Industrial Arts Education.** The purposes of the several phases of industrial arts education; historical background and an analysis for the future. Alternate years. Offered Summer, 1938. Rec. 6. Credit 3. Mr. Hunter.

617. **Curriculum Building in Industrial Education.** (Voc. Ed. 617.) Organization of curricula for shop and related technical instruction in trade technical schools or classes. Prerequisite: 318 or equivalent. Winter. Rec. 3. Credit 3. Mr. Hunter.

620. **Advanced Industrial Arts Design.** Design principles and their application in the industrial arts laboratory with special reference to modern tendencies and new industrial materials. Alternate years. Offered Summer, 1936. Rec. 2. Lab. 2, 3 hr. Credit 2. Mr. Livingston.

630. **Visual Methods in Industrial Arts Education.** Sources, selection, preparation and use of visual instruction materials. Review of scientific studies. Summer. Rec. 2. Lab. 2, 3 hr. Credit 2. Mr. Hunter.

650. **Research in Industrial Arts Education.** (Voc. Ed. 650.) Messrs. Hunter, Livingston.

INDUSTRIAL SCIENCE

C. E. Friley, Dean of Industrial Science

The Division of Industrial Science offers the following curricula:

1. **The Curriculum in Industrial Science** is designed for those students who are interested in certain specialized fields of scientific activity, par-

ticularly as they relate to the practical aspects of industry, commerce, agriculture, engineering, home economics, and veterinary medicine. It also provides thorough fundamental preparation for research in the sciences and for college and university teaching. The student's major work may be taken in one of the following fields:

BACTERIOLOGY: General and systematic; dairy; soil; veterinary and pathogenic; sanitary; household; physiological. (p. 132.)

BOTANY: Plant ecology; plant morphology; mycology; plant pathology; plant physiology; systematic botany. (p. 134.)

CHEMISTRY: Analytical; bio-physical; enzyme; food and sanitary; inorganic and qualitative analysis; organic; physical; plant; physiological and nutritional; soil; textile. (p. 147.)

ECONOMICS AND SOCIOLOGY: Agricultural economics; consumption economics; industrial economics; general economics; rural sociology. (p. 167.)

GENETICS: Heredity in relation to the improvement of animals and plants. (p. 188.)

GEOLOGY: Economic geology; agricultural geology; general geology. (p. 189.)

ECONOMIC HISTORY: Agriculture; industry; commerce. (p. 191.)

MATHEMATICS: Applied (mechanics and physics); biometrics; analysis and geometry. (p. 237.)

PHYSICAL EDUCATION: For men, in combination with a major in another science. (p. 248.)

PHYSICS: Electricity and magnetism; mechanics and heat; illumination. (p. 251.)

ZOOLOGY: Economic zoology; entomology; cytology; embryology and histology; parasitology; physiology; protozoology; wild life conservation; apiculture. (p. 281.)

The curriculum in Industrial Science is outlined on page 226.

Preparation for Medicine and Veterinary Medicine—In connection with the curriculum in Industrial Science, special programs are offered for Pre-Medical and Pre-Veterinary students. See page 230.

2. **The Curriculum in General Science** is planned to meet the needs of the following classes of students:

(a) Those who have not made a definite decision as to their vocation, and who desire an education that is strong and well-balanced in respect to the sciences and general studies, as a foundation for further scientific or professional study, or as a preparation for intelligent citizenship.

(b) Those who expect to teach in the high schools and junior colleges of the state. The provision of a major and two minor fields of study in the Junior and Senior years enables the student to qualify as a teach-

er in at least two of the principal scientific fields represented in the Division of Industrial Science.

The student's major work may be taken in one of the fields listed in the preceding description of the curriculum in Industrial Science. The two minor studies are to be chosen from any of the departments in the Division of Industrial Science, aside from the department in which the major work is taken, or, for sufficient reason, from departments in other divisions.

Such a program presents many advantages in view of the ever increasing inter-relations of the various sciences.

The curriculum in General Science is outlined on page 228.

3. **Curriculum in Chemical Technology.** See page 147.

4. **Curriculum in Agricultural Economics and Rural Sociology.** See page 104.

5. **Curriculum in Industrial Science and Veterinary Medicine.** See page 231.

6. **Combined Curriculum in Science and Law.** See page 229.

7. **Combined Curriculum in Science and Medicine.** See page 231.

Curriculum in Industrial Science

Leading to the degree of Bachelor of Science.
For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Composition Engl. 101[1]	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	*Analytic Geometry Math. 103	5
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Biology (See note)	3	Biology (See note)	3	Biology (See note)	3
				Health Education Hyg. 104 (women)	2
Military 121 (men)	1	Military 122 (men)	1	Military 123 (men)	1
	15 or 16		15 or 16		16 or 18

Note—Students will choose one of the following sequences: Bot. 101, 102, 103; Bot, 101, 102; Zool. 114; Zool. 104, 105, Bot. 101; Zool. 111, 112, 113.

In addition to the courses listed above, each student will be required to include in his schedule: I.S. 104, 105, 120, Orientation; Phys.Ed. ,each quarter, (For women, 1 credit for the year; required of men without credit); Psych. 110, Social Ethics (Women, six lectures, Fall quarter).

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

*Students planning to Major in Economics may substitute Mathematics of Investment, Math. 206, for Math. 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Early 19th Century Engl. 254	3	Mid 19th Century Engl. 255	3	Reasoning & Writing Engl. 205	3
French or German M.L. 201 or 231	3	French or German M.L. 202 or 232	3	French or German M.L. 203 or 233	3
General Physics Phys. 211	4	General Physics Phys. 212	4	General Physics Phys. 213	4
Options (see below)	6	Options (see below)	6	Options (see below)	6
Military 221 (men)	1	Military 222 (men)	1	Military 223 (men)	1
	16 or 17		16 or 17		17

In addition to the courses listed above, each student will be required to include in his schedule each quarter: Phys.Ed. (For women, 1 credit for the year; required of men without credit).
*For sufficient reason another course in English, or a course in Technical Journalism or History may be substituted for Engl. 205.

OPTIONS: The student will choose one of the following options, which will constitute the immediate basis for the field of his major study in the Junior and Senior years.

BACTERIOLOGY:	Chem. 255, 3 cr.; and Govt. 214, 3 cr.;	Chem. 256, 3 cr.; Psych. 204, 3 cr.;	Chem. 253, 3 cr. Bact. 304A, 3 cr.
BOTANY:	Bot. 344, 3 cr.; and Geol. 201, 3 cr.;	Bot. 205, 4 cr.; Geol. 202, 3 cr.;	Bot. 207, 4 cr. Geol. 203, 3 cr.
CHEMISTRY:	Chem. 201, 2 cr.; and Chem. 211, 2 cr.;	Chem. 202, 2 cr.; Chem. 212, 4 cr.;	Chem. 203, 3 cr. Chem. 213, 3 cr.
ECONOMICS:	Ec. 201, 3 cr.; and Hist. 211, 3 cr.;	Ec. 202, 3 cr.; Hist. 212, 3 cr.;	Ec. 203, 3 cr. Hist. 213, 3 cr.
GENETICS:	Chem. 255, 3 cr.; and Bot. or Zool. 3 cr.;	Chem. 256, 3 cr.; Bot. or Zool., 3 cr.;	Chem. 253, 3 cr. Bot. or Zool., 3 cr.
GEOLOGY:	Geol. 201, 4 cr.; and C.E. 321, 3 cr.;	Geol. 202, 4 cr.; C.E. 322, 3 cr.;	Geol. 203, 4 cr. C.E. 323, 3 cr.
ECONOMIC HISTORY:	Govt. 214, 3 cr.; and Hist. 211, 3 cr.;	Hist. 234, 3 cr.; Hist. 212, 3 cr.;	Hist. 235, 3 cr. Hist. 213, 3 cr.
MATHEMATICS:	Math. 211, 4 cr.; and Hist. 211, 3 cr.;	Math. 212, 4 cr.; Hist. 212, 3 cr.;	Math. 213, 4 cr. Hist. 213, 3 cr.
PHYSICAL EDUCATION:	Phys.Ed. 304, 2 cr.; and Psych. 204, 3 cr.;	Phys.Ed. 305, 2 cr.; Psych. 334, 3 cr.;	Phys.Ed. 306, 2 cr. Voc.Ed. 304, 3 cr.
PHYSICS:	Math. 211, 4 cr.; and Hist. 211, 3 cr.;	Math. 212, 4 cr.; Hist. 212, 3 cr.;	Math. 213, 4 cr. Hist. 213, 3 cr.
ZOOLOGY:	Zool. 225, 5 cr.; or Zool. 274, 4 cr.; and Hist. 211, 3 cr.;	Zool. 234, 4 cr.; Hist. 212, 3 cr.;	Zool. 224, 4 cr. Hist. 213, 3 cr.

JUNIOR AND SENIOR YEARS

1. The program of the Junior and Senior years will cover a minimum of ninety-six credits, sixteen each quarter, and will be planned to carry forward and expand the field of the student's major study as represented by the Option chosen in the Sophomore year. During the last quarter of the Sophomore year the complete program will be worked out by the student in conference with the Head of the Major Department, subject to the approval of the Dean of Industrial Science. Duplicate copies are to be filed in the Dean's office.

2. The subjects making up the program of the Junior and Senior years must ordinarily be of Senior college rank.

3. The following subjects must be included as indicated, unless completed previously:

(a) French or German, M.L. 301, 302, 303; or 331, 332, 333. Junior year.

(b) Principles of Economics, Ec. 201, 202. Junior year.

(c) American Government, Govt. 315. Junior year.

(d) Extempore Speaking, P.S. 311, 3 credits. Senior year.

er in at least two of the principal scientific fields represented in the Division of Industrial Science.

The student's major work may be taken in one of the fields listed in the preceding description of the curriculum in Industrial Science. The two minor studies are to be chosen from any of the departments in the Division of Industrial Science, aside from the department in which the major work is taken, or, for sufficient reason, from departments in other divisions.

Such a program presents many advantages in view of the ever increasing inter-relations of the various sciences.

The curriculum in General Science is outlined on page 228.

3. **Curriculum in Chemical Technology.** See page 147.

4. **Curriculum in Agricultural Economics and Rural Sociology.** See page 104.

5. **Curriculum in Industrial Science and Veterinary Medicine.** See page 231.

6. **Combined Curriculum in Science and Law.** See page 229.

7. **Combined Curriculum in Science and Medicine.** See page 231.

Curriculum in Industrial Science

Leading to the degree of Bachelor of Science.
For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Composition Engl. 101[1]	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	*Analytic Geometry Math. 103	5
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Biology (See note)	3	Biology (See note)	3	Biology (See note)	3
				Health Education Hyg. 104 (women)	2
Military 121 (men)	1	Military 122 (men)	1	Military 123 (men)	1
	15 or 16		15 or 16		16 or 18

Note—Students will choose one of the following sequences: Bot. 101, 102, 103; Bot, 101, 102; Zool. 114; Zool. 104, 105, Bot. 101; Zool. 111, 112, 113.

In addition to the courses listed above, each student will be required to include in his schedule: I.S. 104, 105, 120, Orientation; Phys.Ed. ,each quarter, (For women, 1 credit for the year; required of men without credit); Psych. 110, Social Ethics (Women, six lectures, Fall quarter).

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

*Students planning to Major in Economics may substitute Mathematics of Investment, Math. 206, for Math. 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Early 19th Century Engl. 254	3	Mid 19th Century Engl. 255	3	Reasoning & Writing Engl. 205	3
French or German M.L. 201 or 231	3	French or German M.L. 202 or 232	3	French or German M.L. 203 or 233	3
General Physics Phys. 211	4	General Physics Phys. 212	4	General Physics Phys. 213	4
Options (see below)	6	Options (see below)	6	Options (see below)	6
Military 221 (men)	1	Military 222 (men)	1	Military 223 (men)	1
	16 or 17		16 or 17		17

In addition to the courses listed above, each student will be required to include in his schedule each quarter: Phys.Ed. (For women, 1 credit for the year; required of men without credit).
*For sufficient reason another course in English, or a course in Technical Journalism or History may be substituted for Engl. 205.

OPTIONS: The student will choose one of the following options, which will constitute the immediate basis for the field of his major study in the Junior and Senior years.

BACTERIOLOGY:	Chem. 255, 3 cr.; and Govt. 214, 3 cr.;	Chem. 256, 3 cr.; Psych. 204, 3 cr.;	Chem. 253, 3 cr. Bact. 304A, 3 cr.
BOTANY:	Bot. 344, 3 cr.; and Geol. 201, 3 cr.;	Bot. 205, 4 cr.; Geol. 202, 3 cr.;	Bot. 207, 4 cr. Geol. 203, 3 cr.
CHEMISTRY:	Chem. 201, 2 cr.; and Chem. 211, 2 cr.;	Chem. 202, 2 cr.; Chem. 212, 4 cr.;	Chem. 203, 3 cr. Chem. 213, 3 cr.
ECONOMICS:	Ec. 201, 3 cr.; and Hist. 211, 3 cr.;	Ec. 202, 3 cr.; Hist. 212, 3 cr.;	Ec. 203, 3 cr. Hist. 213, 3 cr.
GENETICS:	Chem. 255, 3 cr.; and Bot. or Zool. 3 cr.;	Chem. 256, 3 cr.; Bot. or Zool., 3 cr.;	Chem. 253, 3 cr. Bot. or Zool., 3 cr.
GEOLOGY:	Geol. 201, 4 cr.; and C.E. 321, 3 cr.;	Geol. 202, 4 cr.; C.E. 322, 3 cr.;	Geol. 203, 4 cr. C.E. 323, 3 cr.
ECONOMIC HISTORY:	Govt. 214, 3 cr.; and Hist. 211, 3 cr.;	Hist. 234, 3 cr.; Hist. 212, 3 cr.;	Hist. 235, 3 cr. Hist. 213, 3 cr.
MATHEMATICS:	Math. 211, 4 cr.; and Hist. 211, 3 cr.;	Math. 212, 4 cr.; Hist. 212, 3 cr.;	Math. 213, 4 cr. Hist. 213, 3 cr.
PHYSICAL EDUCATION:	Phys.Ed. 304, 2 cr.; and Psych. 204, 3 cr.;	Phys.Ed. 305, 2 cr.; Psych. 334, 3 cr.;	Phys.Ed. 306, 2 cr. Voc.Ed. 304, 3 cr.
PHYSICS:	Math. 211, 4 cr.; and Hist. 211, 3 cr.;	Math. 212, 4 cr.; Hist. 212, 3 cr.;	Math. 213, 4 cr. Hist. 213, 3 cr.
ZOOLOGY:	Zool. 225, 5 cr.; or Zool. 274, 4 cr.; and Hist. 211, 3 cr.;	Zool. 234, 4 cr.; Hist. 212, 3 cr.;	Zool. 224, 4 cr. Hist. 213, 3 cr.

JUNIOR AND SENIOR YEARS

1. The program of the Junior and Senior years will cover a minimum of ninety-six credits, sixteen each quarter, and will be planned to carry forward and expand the field of the student's major study as represented by the Option chosen in the Sophomore year. During the last quarter of the Sophomore year the complete program will be worked out by the student in conference with the Head of the Major Department, subject to the approval of the Dean of Industrial Science. Duplicate copies are to be filed in the Dean's office.

2. The subjects making up the program of the Junior and Senior years must ordinarily be of Senior college rank.

3. The following subjects must be included as indicated, unless completed previously:

(a) French or German, M.L. 301, 302, 303; or 331, 332, 333. Junior year.

(b) Principles of Economics, Ec. 201, 202. Junior year.

(c) American Government, Govt. 315. Junior year.

(d) Extempore Speaking, P.S. 311, 3 credits. Senior year.

4. A minimum of thirty credits shall be chosen from the field in which the major work is taken. In most cases it is desirable that this minimum be exceeded. In addition, such supporting subjects from allied departments shall be included as are necessary for the proper development of the major field.

5. The remaining credits may be selected from other departments in the Division of Industrial Science, or from other Divisions of the College. It is strongly urged that the student includes additional work in English, Government, History, Music, Physical Education, Psychology, Public Speaking, or Religious Education.

Curriculum in General Science

FRESHMAN YEAR

The Freshman year is identical with that of the Curriculum in Industrial Science. page 226.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Early 19th Century Engl. 254	3	Mid-19th Century Engl. 255	3	Reasoning & Writing Engl. 205	3
The Social Sciences Hist. 211	3	The Social Sciences Hist. 212	3	The Social Sciences Hist. 213	3
French or German M L. 201 or 231	3	French or German M.L. 202 or 232	3	French or German M.L. 203 or 233	3
†Electives	7	†Electives	7	†Electives	7
Military 221 (men)	1	Military 222 (men)	1	Military 223 (men)	1
	16 or 17		16 or 17		17

In addition to the courses listed above, each student will be required to include in his schedule each quarter: Phys.Ed. (For women, 1 credit for the year; required of men without credit).

*For sufficient reason another course in English, or a course in Technical Journalism or History, may be substituted for Engl. 205.

†Electives: The student will choose two sequences from the following groups. It is expected that the major work of the Junior and Senior years will be taken in the field represented by one of the sequences so chosen.

BIOLOGICAL SCIENCES

BACTERIOLOGY:	Chem. 255, 3 cr.;	Chem. 256, 3 cr.;	Bact. 304, 5 cr.
BOTANY:	Bot. 102, 3 cr.;	Bot. 205, 4 cr.;	Bot. 206, 4 cr.
GENETICS:	Chem. 255, 3 cr.;	Chem. 256, 3 cr.;	Chem. 253, 3 cr.
PHYSICAL EDUCATION:	Phys.Ed. 304, 2 cr.;	Phys.Ed. 305, 2 cr.;	Phys.Ed. 306, 2 cr.
(for Men)	and Psych. 204, 3 cr.;	Psych. 334, 3 cr.;	Voc.Ed. 304, 3 cr.
ZOOLOGY:	Zool. 203, 4 cr.;	Zool. 234, 4 cr.;	Zool. 255, 5 cr.

PHYSICAL SCIENCES AND MATHEMATICS

CHEMISTRY:	Chem. 211, 4 cr.;	Chem. 212, 4 cr.;	Chem. 213, 4 cr.
	or Chem. 331, 4 cr.;	Chem. 332, 4 cr.;	Chem. 333, 4 cr.
GEOLOGY:	Geol. 201, 4 cr.;	Geol. 202, 4 cr.;	Geol. 203, 4 cr.
MATHEMATICS:	Math. 211, 4 cr.;	Math. 212, 4 cr.;	Math. 213, 4 cr.
PHYSICS:	Phys. 211, 4 cr.;	Phys. 212, 4 cr.;	Phys. 213, 4 cr.

SOCIAL SCIENCES

ECONOMICS AND SOCIOLOGY:	Ec. 201, 3 cr.;	Ec. 202, 3 cr.;	Ec. 203, 3 cr.
HISTORY:	Govt. 214, 3 cr.;	Hist. 234, 3 cr.;	Hist. 235, 3 cr.
PSYCHOLOGY:	Psych. 204, 3 cr.;	Psych. 334, 3 cr.;	Psych. 335, 3 cr.

JUNIOR AND SENIOR YEARS

1. In the Spring quarter of the Sophomore year the student will select a major and two minor fields of study, which will form the basis for the program of the Junior and Senior years. This program will cover a minimum of ninety-six credits, sixteen each quarter. The complete program will be worked out by the student in conference with the Head of the Major Department, subject to the approval of the Dean of Industrial Science. Duplicate copies are to be filed in the Dean's office.

2. The field of the major study, covering a minimum of twenty-seven credits, shall be one of the Departments (Psychology excepted) represented by the electives of the Sophomore year. The minor fields, each covering a minimum of fifteen credits, may be taken in any other departments of the Division of Industrial Science or, for sufficient reason, from departments in other Divisions. If the major field is Physical Education, one of the minor fields must be in another science and must include at least twenty-seven hours. Students preparing to teach may count the required work in Vocational Education as a minor.

3. The subjects making up the program of the Junior and Senior years must ordinarily be of Senior college rank.

4. The following subjects must be included as indicated, unless completed previously:

(a) French or German, M.L. 301, 302, 303; or 331, 332, 333. Junior year.

(b) Principles of Economics, Ec. 201, 202. Junior year.

(c) American Government, Govt. 315. Junior year.

(d) Extempore Speaking, P.S. 311, 3 credits. Senior year.

5. The remaining credits may be selected from other departments in the Division of Industrial Science, or from other Divisions of the College. It is strongly urged that the student include additional work in English, Government, History, Music, Physical Education, Psychology, Public Speaking, or Religious Education.

Combined Curriculum in Science and Law

Leading to the degree of Bachelor of Science.

Students planning for the study of law may receive the degree of Bachelor of Science from Iowa State College upon satisfying the following requirements:

1. Completion of the first three years in the curriculum in Industrial Science with major in economics;

2. Completion of the first year of the law curriculum in a recognized law school;

3. Transfer back to this College of credits earned in the law school;

4. Fulfilling the quality point requirement;

5. Formal application for the degree at least three months in advance of its award.

PREPARATION FOR THE STUDY OF MEDICINE

Curriculum for Pre-Medical and Pre-Veterinary Students

For entrance requirements, see page 36.

Notes: 1. Students preparing for the regular Curriculum in Veterinary Medicine, page 262, for admission to which one year of college work is required, will take the Freshman year as indicated below, with the modifications suggested in the footnote. See also Restricted Enrollment, page 263.

2. Pre-Medical students will take at least the work of the Freshman and Sophomore years, as outlined below. This program covers the minimum requirements for admission to medical school. In this connection attention is called to the Combined Curriculum in Science and Medicine outlined below.

3. Students in the six-year combined Curriculum in Industrial Science and Veterinary Medicine will take the Freshman and Sophomore years as outlined below. The requirements for the other four years of this curriculum are set forth on page 231.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl 103	3
Animal Biology Zool. 111	4	Animal Biology Zool. 112	4	†Animal Biology Zool. 113	4
*College Algebra Math. 101	5	*Plane Trigonometry Math. 102A	5	*Ind. History of U. S. Hist. 235	3
Military 121	1	Military 122	1	Military 123	1
	17		17		15

†Pre-Veterinary students will substitute Bot. 101, General Botany.
*Pre-Veterinary students may substitute one of the following: M L. 201, 202, 203, French; M.L. 231, 232, 233, German; Hist. 211, 212, 213, Introduction to the Social Sciences.
In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Orientation, I.S. 104, 105, 120.
[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Organic Chemistry Chem. 331	4	Organic Chemistry Chem. 332	4	Organic Chemistry Chem. 333	4
French or German M.L. 201 or 231	3	French or German M.L. 202 or 232	3	French or German M.L. 203 or 233	3
General Physics Phys. 211	4	General Physics Phys. 212	4	General Physics Phys. 213	4
*Electives	4	*Electives	4	Vertebrate Zoology Zool. 224	4
Military 221	1	Military 222	1	Military 223	1
	16		16		16

In addition to he courses listed above, each student will be required to include in his schedule: Phys.Ed 201 202 203.
*The elective subjects are to be chosen with a view to satisfying special requirements of the Medical school which the student expects to enter.

Combined Curriculum in Science and Medicine

Leading to the degree of Bachelor of Science.

Students planning for the study of medicine may receive the degree of Bachelor of Science from Iowa State College upon satisfying the following requirements:

1. Completion of the two years of the Pre-Medical curriculum, outlined above;
2. Completion of a third or Junior year at Iowa State College, with the principal studies in Biological Sciences and Chemistry; (Ec. 201, 202; Govt. 315; P.S. 311; Mod. Lang. 301, 302, 303, or M.L. 331, 332, 333 must be included unless previously completed.)
3. Completion of the first year of the medical curriculum in a Class A medical college;
4. Transfer back to this College of credits earned in the medical school;
5. Fulfilling the quality point requirement;
6. Formal application for the degree at least three months in advance of its award.

Curriculum in Industrial Science and Veterinary Medicine (six years)

Leading to the degree of Bachelor of Science and the degree of Doctor of Veterinary Medicine.

The following curriculum is designed to meet the needs of students who wish to secure a thorough foundation in the biological and chemical sciences preliminary to the study of veterinary medicine. The degree of Bachelor of Science is granted at the end of the fourth year, and the degree of Doctor of Veterinary Medicine upon the completion of the sixth year. The longer curriculum gives the student an opportunity to prepare himself more effectively for investigational work.

At the present time the better colleges granting degrees in human medicine require two years of collegiate preparation. Veterinary Medicine is quite as exacting in its requirements, particularly in the case of those students who wish to go into governmental or research work. The opportunities open to students well grounded both in science and in veterinary medicine are excellent. Many positions in the Bureau of Animal Industry of the Department of Agriculture, in the experiment stations of the land-grant colleges, and in the teaching staffs of the various veterinary schools and agricultural colleges, are open every year. In the past it has been difficult to secure men with proper training. This curriculum is designed to prepare men for such positions.

For entrance requirements, see page 36.

FIRST AND SECOND YEARS

The first and second years are identical with the Freshman and Sophomore years of the Curriculum for Pre-Medical and Pre-Veterinary students. See page 230.

THIRD AND FOURTH YEARS

The student will classify with the Dean of Veterinary Medicine as a

senior college student in Industrial Science and Veterinary Medicine. In the quarter in which he completes the requirements for the Bachelor's degree, he will also register with the Dean of Industrial Science. He will outline his curriculum in accordance with the following rules.

1. A minimum of 16 hours per quarter must be carried.
2. All courses of the first and second years of the curriculum in Veterinary Medicine not already taken must be completed, excepting Chemistry 174, 175.
3. English 205 or English 304 and at least fifteen hours of electives, i.e., courses not required of students pursuing the four-year curriculum in Veterinary Medicine, must be completed. The electives should include the second year of the foreign language begun previously, unless already completed.

The degree of Bachelor of Science will be conferred upon the fulfillment of the preceding requirements.

FIFTH AND SIXTH YEARS

The student will classify with the Dean of Veterinary Medicine as a senior college student in Veterinary Medicine. His program will cover the work as outlined for the third and fourth years of the curriculum in Veterinary Medicine. A minimum of 18 hours per quarter must be carried.

The degree of Doctor of Veterinary Medicine will be conferred upon the fulfillment of the preceding requirements.

INDUSTRIAL SCIENCE

C. E. Friley, Dean of Industrial Science

Description of Courses

104, 105. **Orientation.** Lectures and class work designed to aid the first year student in adjusting himself to his environment both in college and afterwards. (104) College Problems. Fall. Lectures 2. (105) Survey of the Sciences. Winter. Lectures 1. Required each course.

120. **Personal Development.** The personal, social, and occupational relationships that are of importance in the development of personality. Fall, Winter, Spring. Lect. 1. Required.

417. **Directed Observation and Practice Teaching in the Sciences.** (Voc Ed. 417.) Observation, evaluation of instruction, lesson planning, and classroom teaching in the sciences. Prerequisite: Voc. Ed. 305, or equivalent, special methods, and 20 credits in subject matter field. To be arranged in advance. Fall, Winter, Spring. Credit 5.

LANDSCAPE ARCHITECTURE

P. H. Elwood, Jr., Head of Department

Assistant Professors Hanson, Rothacker

Extension Workers Fitzimmons, Johnson, Morris

For information concerning the Division of Agriculture, see page 58.

The most important function of Landscape Architecture is the adaptation of land areas to human service whether in urban regions or in the broad rural countryside. Its relation to the location of buildings and the

treatment of their surroundings requires a consideration of architectural and engineering features. The materials used are mainly included within the fields of horticulture, forestry, geology, and civil engineering, to which it bears much the same relation that architecture does to structural engineering and similar technical subjects.

Landscape Architecture includes the design, construction, planting, and maintenance of home grounds, estates, parks, cemeteries, school grounds, public and private institutions and sub-divisions, towns and regional planning, including recreational landscape design, and other planning problems

There are opportuities for competent professional men, both in private practice and in public employ as landscape architects, city planners, park superintendents, landscape recreational engineers for large state and national holdings and public reservations as well as in various phases of government service.

This department is accredited by the American Society of Landscape Architects and graduates are eligible for competition for the two-year traveling Fellowship at the American Academy in Rome. Each year two graduates are selected for competition for the Ryerson European traveling Fellowship of the Lake Forest Foundation valued at approximately $1,200.

Students in Landscape Architecture who wish to take a five-year curriculum are advised to inform the head of the department as early as possible so that their classification may be somewhat broadened and liberalized.

Curriculum in Landscape Architecture

Leading to the degree of Bachelor of Science.

Six months of practical landscape work is required before graduation See page 117.

For entrance requirements, see page 36.

For graduate work, see page 97.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credit
Architectural Design Arch.E. 271B[1]	3	Architectural Design Arch.E. 272B	3	Architectural Design Arch.E. 273B	3
Freehand Drawing Arch.E. 114	1	Freehand Drawing Arch.E. 115	1	Freehand Drawing Arch.E. 325	2
General Botany Bot. 101	3	General Botany Bot. 102	3	Surveying C.E. 116	3
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102A	5	Princ. Landscape Design L.A. 106	1
Military 121	1	Military 122	1	General Horticulture Hort. 114 or General Botany Bot. 103	3
				Military 123	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); L.A. 105 (Winter); Orientation, Ag. 101, 102; Ag. 104, see page 117.

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Hist. Landscape Design L.A. 201	2	Hist. Landscape Design L.A. 202	3	Hist. Landscape Design L.A. 203	3
El. of Landscape Design L.A. 211	2	El. of Landscape Design L.A 212	2	El. of Landscape Design L.A. 213	2
Princ. Landscape Design L.A. 107	3	Plant Materials L.A 231	2	Plant Materials L.A. 232	3
Freehand Drawing Arch.E. 221	1	Architectural Design Arch.E. 381B	2	Freehand Drawing Arch.E. 231	2
Freehand Drawing Arch.E. 222	1	General Chemistry Chem. 102	4	Garden Flowers Hort. 244	3
General Chemistry Chem. 101	4	Surveying C.E. 218	3	Business Law Ec. 365	3
Surveying C.E. 217	4	Military 222	1	Military 223	1
Military 221	1				
	18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Landscape Design L.A. 311	3	Landscape Design L.A. 312	3	Landscape Design L.A. 313	3
Plant Materials L.A. 333	3	Planting Design L.A. 334	3	Planting Design L.A. 335	3
Details of Construction L.A. 301	3	Details of Construction L.A. 302	3	Adv. Landscape Constr. L.A. 303	2
Technical Journalism T.Jl. 225	3	American Government Govt. 315	3	Landscape Practice L.A. 341	R
†General Psychology Psych. 204	3	†Feature Writing T.Jl. 335	3	†General Physics Phys. 204	3
Extempore Speaking P.S. 311	2	Soils Soils 364	3	Physiography Geol. 324	4
				Farm Forestry For. 100	3
	17		18		18

SENIOR YEAR

Adv. Landscape Design L.A. 411	4	Adv Landscape Design L.A. 412	4	Adv. Landscape Design L.A. 413	4
City or Town Planning L.A. 401	3	Institutional Planning L.A. 402	2	Rec. and Reg. Planning L.A. 403	3
Planting Composition L.A. 436	3	World Literature Engl. 355	3	†Maintenance Hort 315	3
History of Architecture Arch.E. 351	3	History of Architecture Arch.E. 352	3	History of Architecture Arch.E. 353	3
†Roads and Pavements C.E. 354	3	†Engr. City Planning C.E. 404	3	Landscape Practice L.A. 342	R
Freehand Drawing Arch.E. 327	2	Freehand Drawing Arch.E. 324	2	El. Entomology Zool. 274	4
	18		17		17

Park and Construction Option for Senior Year

Park Plan., Constr., Plant. L.A. 421	4	Park Plan., Constr., Plant. L.A. 422	4	Park Plan., Constr., Plant. L.A. 423	4
City or Town Planning L.A. 401	3	Institutional Planning L.A. 402	2	Rec. and Reg. Planning L.A. 403	3
Planting Composition L.A. 436	3	World Literature Engl. 355	3	Landscape Practice L.A. 342	R
Roads and Pavements C.E. 354	3	Engr. City Planning C.E. 404	3	†Maintenance Hort. 315	3
Public Rec. Facilities L.A. 404	3	Electives	5	El. Entomology Zool. 274	4
Electives	2			Electives	3
	18		17		17

†May be omitted by students appointed to the Reserve Officers' Training Corps. See page 244. C.C. 414. National, Regional, State and Town Planning is required for graduation.

Description of Courses

105. **Introduction to Landscape Architecture.** The field of landscape architecture, its scope and methods. Winter. Lect. 1. Required.

106, 107. **Theory and Principles of Landscape Design.** Lectures, recitations, assigned readings and reports. (106) Spring. Lect. 1. Credit 1. (107) Fall. Lect. 1. Rec. 2. Credit 3.

201. **History of Landscape Architecture.** Introduction to the study of the great examples of landscape architecture throughout the world. Special emphasis on the relations of the arts to each other and to landscape architecture. Readings, reports. No prerequisite. Fall. Lectures 2. Credit 2.

202, 203. **History of Landscape Design.** Development of landscape architecture from antiquity to modern times, with its relation to and the influence of allied arts. Lectures, readings, abstracts, and reports. Winter, Spring, respectively. Lect. 3. Credit 3 each course.

206. **Planning Home Landscapes.** Appreciation of our native and humanized landscapes, with special attention to the improvement of the home grounds. Open to all students. Fall, Winter, Spring. Lect. 2. Credit 2.

208. **Rural Landscape Design.** Preparation of plans for farmsteads, small house lots, home and school grounds, as well as other public areas. Especially designed to meet the needs of Agricultural Engineering and Horticulture students, and those interested in County Agent work. Winter. Lect. 1 or 2. Lab. 2 or 1, 3 hr. Credit 3.

211, 212, 213. **Elements of Landscape Design.** Simple problems in design and presentation. (211) Fall. Prerequisite: 106, C.E. 116. (212) Winter. Prerequisite: 211. (213) Spring. Prerequisite: 212. Lab. 2, 3 hr. Credit 2 each course.

231, 232. **Plant Materials.** (231) An introduction to the study of plant materials as used in landscape architecture. Classification, nomenclature, requirements, sources, with winter twig identification. Winter. Lect. 1. Lab. 1, 3 hr. Credit 2 (232) Continuation of 231. Applied to deciduous trees and shrubs with special emphasis on their seasonal landscape character and usage. Spring. Lect. 1. Lab. 2, 3 hr. Credit 3.

301, 302, 303. **Details of Construction and Office Administration.** Lectures, readings, drawings, and problems. (301) Fall. Prerequisite: C.E. 116. (302) Winter. Prerequisite: 301. Lect. 3. Credit 3 each course. (303) Prerequisite: 302. Theory and drafting room problems in landscape construction including grading, drainage, and utility plans, estimate of cuts, fills, and cost data. Spring. Lab. 2, 3 hr. Credit 2.

311, 312, 313. **Landscape Design.** Design of private and public properties based on actual topographies. Drafting, field work, reports, criticisms. Prerequisite: 213. Fall, Winter, Spring, respectively. Lab. 3, 3 hr. Credit 3 each course.

333. **Plant Materials.** Continuation of 232. Trees and shrubs, vines, evergreens, and herbaceous material. Field trips and reports. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

334, 335. **Planting Design.** Arrangement and use of plants in landscape and architectural design with drafting and field practice. Prerequisite: 311, 333. Winter, Spring. Lect. 1. Lab. 2, 3 hr. Credit 3 each course.

341, 342, 343. **Travel and Practice.** Study of notable works in landscape design and observation of actual construction and operation in the field. (341) Inspection tour. Spring. Junior year. Required. (342) Inspection tour. Spring. Senior year. Required. (343) Foreign or domestic travel course. First hand study, under direction of Mr. Elwood, of the masterpieces of landscape architecture and allied arts in Europe and Asia as well as America. Not required but recommended for all advanced students or graduates. (341) (342) No credit. (343) Summer. Credit 3 to 10.

366. **Special Problems.** Selected problems for balancing or completing individual student requirements. Fall, Winter, Spring.

401. **City or Town Planning.** Lectures and text on functional planning of the city including the fundamentals and historical development of civic design, with particular attention to the broader phases of city planning. Fall. Lect. 1. Rec. 2. Credit 3.

402. **Institutional Planning.** Design of school, airport, and other public and semi-public institutional properties. Prerequisite: 401. Winter. Lect. 1. Rec. 1. Credit 2.

403. **Recreational and Regional Planning.** Recreational aspects of landscape architecture including parks, playgrounds, waterfronts, and public reservations. Prerequisite: 402, except for Forestry students, or by special permission from head of department. Spring. Lect. 1. Rec. 2. Credit 3.

404. **Public Recreational Facilities.** A consideration of the principles of their design, construction, and operation with special emphasis on national and state parks and forests. Fall. Lect. 2. Rec. 1. Credit 3.

411, 412, 413. **Advanced Landscape Design.** Design of public, semi-public, and private properties. Prerequisite: 313. Lab. 4, 3 hr. Credit 4.

421, 422, 423. **Park Planning, Planting, and Construction.** Prerequisite: 303, 313, 335. Fall, Winter, Spring. Lab. 4, 3 hr. Credit 4 each course.

436. **Advanced Planting Composition and Design.** The principles of design applied to the use of plants in various types of landscape problems. Prerequisite: 335. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

600. **Research.** Mr. Elwood.

LIBRARY

CHARLES H. BROWN, Head of Department

Associate Professor Dunbar; Assistant Professor Warner; Instructors Crawford, Ford, Orr

For information concerning the Division of Industrial Science, see page 69.

INSTRUCTION IN LIBRARY USAGE AND METHODS

Courses required of all Freshmen are designed to give facility in the use of books and the use of libraries.

In addition, the library affords facilities for bibliographic research in the scientific and technical literature of the departments giving graduate instruction. "Bibliographic Research" (Lib. 614), may be allowed as either major or minor credit in any department.

Graduate Work in Library Science

The department also offers courses designed particularly to meet the demand for university librarians and assistants who have had considerable work in the pure and applied sciences. These subjects are open only to those holding some position on the library staff. They should be supplemented eventually by a year's work at a graduate library

school and are not to be considered as a substitute for such work. Courses 614 to 619 may be taken as a divided major with certain selected departments and will lead to the degree of Master of Science. A reading knowledge of both French and German will be required.

Description of Courses

106. **Library Instruction.** Use of books, use of library, and a survey of literature of major curricula.

A. For students in agriculture. Six weeks. Fall.

B. For students in home economics. One half of the course on Orientation, (H.Ec. 101). Fall.

C. For students in engineering. Six weeks. Winter.

D. For students in industrial science. Three weeks of the course on Orientation, (I.S. 104). Fall.

614. **Bibliographic Research.** Lectures and practice on the location of printed material and on the preparation of bibliographies on technical and scientific subjects. Fall, Winter, Summer. Credit 1. Mr. Brown, Mr. Dunbar.

For members of library staff only

615. **Bibliographic Research, Advanced.** Primarily on trade and subject bibliographies, especially in foreign languages. Prerequisite: 614, reading knowledge of French and German. Winter. Credit 1. Mr. Brown.

616. **Order and Accessions.** Ordering books, serials, book buying, emphasis on methods and tests to determine effectiveness. Fall. Lab. 2, 3 hr. Conf. 1. Credit 3. Mr. Brown.

617. **Classification of Books.** Dewey Decimal classification and Library of Congress classification, book numbers. Emphasis on methods and tests. Winter Lab. 2, 3 hr. Conf. 1. Credit 3. Mr. Dunbar.

618. **Cataloging.** Dictionary cataloging, subject headings, serials. Emphasis on methods and tests. Spring. Lab. 3, 3 hr. Conf. 1. Credit 4. Mr. Dunbar.

619. **Research.** Investigation testing library methods or the use of library such as "cost factors in various departments of library work," or "time factors in library service." Winter, Spring. Mr. Brown.

MATHEMATICS

E. R. Smith, Head of Department

Professors Holl, McKelvey, Roberts, Snedecor; Associate Professors Allen, Colpitts, Gouwens, Herr, Robinson, *Turner; Assistant Professors Atanasoff, Brandt, Daniells, Fleming, Hinrichsen; Instructors Anderson, Brandner, Higdon, Robertson, H. Smith; Graduate Assistants Cook, Snoke; Fellows Gage, Legvold, Watson

For information concerning the Division of Industrial Science, see page 69.

The work of the Department of Mathematics is directed to the following ends:

1. The development of intellectual strength.
2. Accuracy in presentation of mathematical truths.
3. The acquiring of such command of the subject matter of mathematics as will make it a valuable instrument in higher scientific and technical study and research.

*Absent on leave.

4. The specialized application of mathematics to industry and industrial education.

Curriculum in Industrial Science—Major Mathematics

For Freshman and Sophomore years, see page 226.
For Junior and Senior years, see page 227.

Description of Courses

For description of non-collegiate courses, see page 291.

101. **College Algebra.**** Prerequisite: three semesters secondary-school algebra. Fall, Winter, Spring. Rec. 5. Credit 5.

102. **Plane Trigonometry.** Prerequisite: 101.

A. For students in forestry, industrial science, and landscape architecture. Fall, Winter, Spring. Rec. 5. Credit 5.

C. For students in engineering. Must be preceded or accompanied by Gen Engr. 105. Fall, Winter, Spring. Rec. 4. Credit 4.

103. **Plane Analytic Geometry.** Prerequisite: 102. Fall, Winter, Spring. Rec. 5. Credit 5.

136. **Solid Geometry.** Prerequisite: plane geometry. Fall. Rec. 3. Credit 3.

205. **Mathematics for Students of Agriculture.** Prerequisite: entrance algebra. Fall, Winter, Spring. Rec. 4. Credit 4.

206, 207. **Mathematical Theory of Investments.** Prerequisite: 102. (206) Rec. 5. Credit 5. (207) A second quarter in life insurance will be given occasionally. Rec. 3. Credit 3.

211, 212, 213. **Calculus.** Prerequisite: 103. (211) Differential calculus. (212) Integral calculus with applications. (213) Applied calculus. Fall, Winter, Spring Rec. 4. Credit 4 each course.

300. **Theory of Equations.** Complex numbers, general solutions of the cubic and biquadratic. Horner's and Newton's methods of approximating roots, systems of equations, and elements of determinants. Prerequisite: 213. Spring. Rec. 3. Credit 3.

314, 315. **Differential Equations.** (314) The formulation of practical problems as solutions of differential equations, methods of solving type forms Fall, Spring. (315) Systems of equations, singular solutions, theoretical considerations and an introduction to partial differential equations. Prerequisite: 213. Winter. Rec. 3. Credit 3 each course.

330. **College Geometry.** Geometrical constructions, properties of triangles, transversals, harmonic sections, and systems of circles. Designed for students who expect to teach secondary-school geometry. Prerequisite: 213. Rec. 3. Credit 3.

334. **Analytic Geometry of Three Dimensions.** Particular emphasis on surfaces of the second degree. Prerequisite: 213. Spring. Rec. 3. Credit 3.

400. **Numerical Computation.** Interpolation, numerical solution of equations, approximations, numerical integration, and construction of tables. Prerequisite: 314. Rec. 3. Credit 3.

405, 406. **Biomathematics.** A general course including applications of calculus to biology. Prerequisite: 205. Winter, Spring, respectively. Rec. 3. Credit 3 each course.

441, 442, 443. **Statistical Methods.** Biometrics. Primarily for students doing major work in the biological sciences. Prerequisite: senior college classification. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course.

444, 445. **Statistics Laboratory.** May accompany or follow 441 or 442 respectively. Lab. 1, 3 hr. Credit 1 each course.

490. **History of Mathematics.** Prerequisite: 213 and senior college classification. Winter. Rec. 3. Credit 3.

**Freshman students who show deficient preparation in mathematics may be assigned by the Dean of the Junior College and the Dean of the Division to special classes in non-collegiate mathematics until they are prepared to take up college mathematics.

497. **Teaching Vocational Mathematics in Junior and Senior High Schools.** (Voc. Ed. 497.) Several practical aspects of teaching mathematics such as organization of subject matter, methods of presenting typical topics, and tests for measuring results. Prerequisite: 15 credits of college mathematics. Spring. Lect. and observation 3. Credit 3.

514, 515. **Advanced Calculus.** General derivatives, rationalization, reduction formulas, numerical evaluation of integrals, partial derivatives, line integrals, Green's Theorem with applications to geometry, physics, and mechanics. Prerequisite: 213. Fall, Winter, respectively. Rec. 3. Credit 3 each course.

516. **Definite Integrals.** The important integrals which appear in applied mathematics, including the elliptic type. Prerequisite: 213. Spring. Rec. 3. Credit 3.

535, 536. **Projective Geometry.** Prerequisite: 213. Lect. 3. Credit 3 each course.

540. **Mathematical Statistics.** Prerequisite: 213. Lect. 3. Credit 3.

550. **Vector Analysis as Applied to Physics and Mechanics.** Prerequisite: 213. Rec. 4 or 5. Credit 4 or 5.

554, 555. **Analytical Mechanics.** Statics of a particle, force, impulse, momentum, velocity and acceleration, kinetic and potential energy, central forces, harmonic motion, and other topics in theoretical mechanics. Prerequisite: 213. Fall, Winter, respectively. Rec. 3. Credit 3 each course.

599. **Special Topics.** Mr. Smith, Mr. Snedecor.

600. **Finite Groups.** Lect. 3. Credit 3. Mr. Allen.

604, 605. **Introduction to Higher Algebra.** Lect. 3. Credit 3 each course. Mr. Robinson.

610. **Seminar.** Messrs. Smith, Snedecor, Holl, Atanasoff.

611, 612 613. **Theory of Functions.** The theory of functions of a complex variable and an introduction to the theory of functions of a real variable. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course. Miss Colpitts.

620. **Calculus of Variations.** Lect. 3. Credit 3. Mr. Gouwens.

624, 625. **Differential Equations of Mathematical Physics.** Prerequisite: 314, and Phys. 222. Lect. 3. Credit 3 each course. Mr. Hinrichsen.

626, 627. **Integral Equations.** Lect. 3. Credit 3 each course. Mr. Allen.

631, 632, 633. **Advanced Geometry.** (631) Co-ordinate geometry and higher plane curves. (632) (633) Differential geometry. Fall, Winter, Spring, respectively. Rec. 3. Credit 3 each course. Mr. McKelvey.

640. **Probability.** The application of the theory in the solution of scientific and technical problems. Prerequisite: 213. Lect. 3. Credit 3. Mr. Allen.

651, 652, 653. **Introduction to Mathematical Physics.** (Phys. 651, 652, 653.) Basic mathematics used in theoretical physics. Fundamental topics of classical and modern physics using mathematical concepts and methods. Prerequisite: 314, Phys. 504, 516, 605. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Atanasoff.

654, 655. **Dynamics.** Motion of a particle and of a rigid body. Prerequisite: 314. Lect. 3. Credit 3 each course. Mr. Holl.

656, 657. **Hydrodynamics and Mathematical Theory of Airfoils.** Elementary hydrodynamical theory with applications to aeronautics. Lect. 3. Credit 3 each course. Mr. Turner.

658, 659. **Celestial Mechanics.** Lect. 3. Credit 3 each course. Mr. Hinrichsen.

664, 665. **Mathematics of Elasticity.** (T. & A. M. 664, 665.) Application of a general stress strain and analysis to flexure of beams, torsion of rods, elastic energy of strain, deflection of plates, vibration phenomena, and elastic impact. Prerequisite: 314. Lect. 3. Credit 3 each course. Mr. Holl.

666. **Vibration Problems.** (T. & A M. 666.) Harmonic and non-harmonic vibrations; generalized co-ordinates and Lagrange equations of motion with applications to vibration of beams, columns, plates, and rotating disks. Prerequisite: 314, T. & A. M. 324. Lect. 3. Credit 3. Mr. Holl.

671, 672, 673. **Advanced Mathematics as Related to Problems in Chemistry.** Partial differential equations, and statistical mechanics with especial reference to their application in chemistry. Prerequisite: 213. Lect. 3. Credit 3 each course. Mr. Allen.

674, 675. **Mathematical Theory of Relativity.** Prerequisite 314 Lect. 3. Credit 3 each course. Mr. Allen.

681, 682, 683. **Quantum Mechanics.** (Phys. 681, 682, 683.) Newer developments in the quantum theory and their application to problems in physics and chemistry. Prerequisite: 315, Phys. 323. Alternate years. Offered Fall, Winter, Spring, respectively, 1937-38. Lect. 3. Credit 3 each course. Mr. Atanasoff.

699. **Research.** Messrs. Smith, Snedecor, Allen, Atanasoff, Holl, Brandt.

MECHANICAL ENGINEERING

M. P. CLEGHORN, in Charge of Department

Professors Bevan, Meeker, Norman; Associate Professors Brown, Daasch, Hummel, Major, Olson, Roudebush; Assistant Professors Hug, Nielsen; Shop Instructors Breckenridge, Gesser, Hines, A. Maitland, Spangler

For information concerning the Division of Engineering, see page 63.

The professional services performed by Mechanical Engineers vary from the highly scientific work of research and development through the applied work of design and production, to the management, operation, and sales work of industry. These services are rendered in fields ranging from the conversion and utilization of heat, to the development and design of all kinds of machines, and the manufacture of commodities.

The mechanical engineering curriculum is built upon basic scientific and general courses, followed by the professional courses in the study of heat, design, metals, fuels, fluids, and electricity that are the necessary equipment of all mechanical engineers. Opportunity is presented to elect non-professional courses to round out a balanced education.

During the Senior year a part of the work may be chosen from a group of professional courses in some of the specialized fields, such as manufacturing, power generation, aeronautics, air conditioning, and transportation.

Further specialization would be possible only at the expense of basic education, and logically comes from experience and study after graduation.

Curriculum in Mechanical Engineering

Leading to the degree of Bachelor of Science.
For graduate work, see page 98.
For professional degree, see page 82.
For entrance requirements, see page 36.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
College Algebra Math. 101	5	Plane Trigonometry Math. 102C	4	Analytic Geometry Math. 103	5
Drawing and Projection Engr. Dr. 131	2	Theory of Project. Draw. Engr. Dr. 182	3	Working Drawings Engr. Dr. 133	3
Engineering Problems Gen.Engr. 104	1	Engineering Problems Gen.Engr. 105	1	Military 103 or 123	1
Military 101 or 121	1	Military 102 or 122	1		
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Engr. 114, 115; Library 106C (Winter); Tech. Lect., M.E. 100 (Spring).

[1]The number refers to the description of the course.
[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Differential Calculus Math. 211	4	Integral Calculus Math. 212	4	Applied Calculus Math. 213	4
Mechanics and Heat Phys. 221	5	Elect. and Magnetism Phys. 222	5	Light and Sound Phys. 223	5
Expository Writing Engl. 204	2	Extempore Speaking P.S. 311	2	Engineering Problems Gen.E. 206	1
Engineering Economics Ec. 261	3	Properties of Materials T.&A.M. 334	2	Statics of Engineering T.&A.M. 274	3
Metal Shop M.E. 233	3	Metal Casting M.E. 237	4	Heat Treat. of Metals M.E. 238	4
Military 201 or 221	1	Military 202 or 222	1	Military 203 or 223	1
	18		18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203.

JUNIOR YEAR

Dynamics of Engineering T.&A.M. 344	4	Mechanics of Materials T.&A.M. 324	5	Fuels and Combustion M.E. 440	3
Mechanisms M.E. 310	4	Materials Laboratory T.&A.M. 327	1	Hydraulics T.&A.M. 378	4
Advanced Metal Shop M.E. 341	2	Thermodynamics M.E. 344	5	Machine Design M.E. 315	5
D.C. Machines E.E. 338	3	A.C. Circuits E.E. 339	3	A.C. Machines E.E. 340	3
D.C. Laboratory E.E. 348	1	E.E. Laboratory E.E. 349	1	A.C. Laboratory E.E. 350	1
				†Scientific Papers Engl. 414	3
*Electives	3	Electives	3		
	17		18		19

*Appreciation of Art, C.C. 401, 402, 403, total credit 1, must be included in the electives in the Junior or Senior year.

†May be omitted by students appointed to the Reserve Officers' Training Corps, See page 244.

SENIOR YEAR

Heat Engines M.E. 444	5	Internal Comb. Engines M.E. 445	4	Fluid Mechanics M.E. 414	3
Industrial Organizations M.E. 484	3	Stresses in Machines M.E. 416	3	Dynamics of Mechines M.E. 418	3
Engineering Contracts Engr. 405	3	Engineering Valuation Engr. 407	3	Accounting Ec. 374	4
*Electives	7	Electives	8	Electives	7
	18		18		17

In addition to the courses listed above, each student will be required to include in his schedule: Inspection Trip, M.E. 400 (Fall).

SENIOR ELECTIVES: Not less than 12 credits shall be chosen from the following:

Heating and Ventilation M.E. 424	4	Steam Power Plants M.E. 448	4	Refrigeration and Air Conditioning M.E. 426	4
Aerodynamics of Airplanes M.E. 410	4	Industrial Metallurgy M.E. 435	4	Airplane Design M.E. 415	4
Machine Tools M.E. 434	4	Industrial Engineering M.E. 486	3	Automotive Engine Design M.E. 429	4
Automotive Transportation M.E. 428	3	Airplane Structures M.E. 420	3	Adv. Airplane Structures M.E. 425	3
Time Studies M.E. 455	2	Automotive Engineering M.E. 430	3	Factory Planning M.E. 489	3

The remaining 9 credits of electives in the Senior year may be taken in Military or in other subjects if a definite objective is shown.

Description of Courses

100. **Technical Lecture.** The field of Mechanical Engineering, its opportunities and requirements. One lecture a week. Spring. Required.

231. **Pipe Fitting.** Principles and practice of threaded, flanged, leaded, and welded pipe joints and fittings. For Chem. Engrs. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

232. **Machine Work.** Principles and practice of machine working of metals. Fall, Winter, Spring. Lab. 2, 3 hr. Credit 2.

233 **Metal Shop.** Principles and practice of machine tool and bench working of metals. Forming and fabrication of steels, cast irons, and non-ferrous metals. Fall, Winter, Spring. Lab. 3, 3 hr. Credit 3.

237. **Metal Casting.** Ferrous and non-ferrous molding and casting. Study of processes and equipment. Specifications, control, and testing of products. Prerequisite: Chem. 103 Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

238. **Heat Treatment of Metals.** Heat treatment of carbon and alloy steels, non-ferrous metals, and special alloys. Inspection of tests of heat treated metals. Engineering specifications and control. Prerequisite: Chem. 103. Fall, Winter, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

239. **Metallurgy.** Processing and properties of cast and rolled metals and the effects of heat treatment. For electrical engineers. Prerequisite: Chem. 103, M.E. 232 or 233. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

310. **Mechanisms.** Cams, linkages, principles of gearing. Analytical and graphical study of velocities and accelerations of engine and machine parts. Prerequisite: Engr. Dr. 131; credit or classification in T. & A. M. 344. Fall, Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

315. **Machine Design.** Design of fastenings, pressure vessels, shafts, gearing, belting, clutches. Study of bearings and lubrication. Prerequisite: T. & A. M. 324. Fall, Spring Rec 3. Lab. 2, 3 hr. Credit 5.

341. **Advanced Metal Shop.** Tool material and shapes, cutting speed, power requirements. Prerequisite: 233, 238. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

344 **Thermodynamics.** The properties and fundamental equations of gases and vapors Thermodynamics of heat cycles, air compressors, and steam engines. Prerequisite: Math. 212, Phys. 221. Fall, Winter, Spring. Rec. 4. Lab. 1, 3 hr. Credit 5.

354. **Power Measurement Laboratory.** Practice in calibration of instruments; power measurement. For students with no thermodynamics. Prerequisite: Phys. 221, 222. Fall, Winter, Spring. Lab. 1, 3 hr. Credit 1.

400. **Inspection Trip.** Inspection trips to industrial centers. Prerequisite: Senior classification. Fall.

407. **Mechanical Equipment of Buildings.** The selection, layout, and specifications of the heating, ventilating, cooling, and elevator equipment of buildings. For architectural engineers. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

409. **Mechanical Equipment of Buildings.** A continuation of 407. Winter. Rec. 1. Lab. 2, 3 hr. Credit 3.

410. **Aerodynamics of Airplanes.** Lift and drag characteristics of airfoils; parasite resistance, propellers, performance, altitude effects, stability, and control. Prerequisite. T. & A. M. 344. Fall. Rec. 4. Credit 4.

414. **Fluid Mechanics.** Flow of liquids, gases, and vapors; dimensional analysis, viscous and turbulent flow, velocity measurement, discharge of nozzles, characteristics of blowers. Prerequisite: 344 and T. & A. M. 378. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

415. **Airplane Design.** Stress analysis of wing, fuselage, and landing structures of airplanes. Department of Commerce requirements. Prerequisite: 410, 420. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

416. **Stresses in Machines.** Calculations of stresses in such machine parts as heavy springs, machine frames, crankshafts, thick-walled cylinders, and rotating discs. Prerequisite: 315. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

418. **Dynamics of Machines.** Calculation of periodic forces and torques in engines and machines, and the torsional and transverse vibrations caused by them. Flywheels, governors, and speed regulation. Prerequisite: 310, 315. Spring. Rec. 3. Credit 3.

420. **Airplane Structures.** Theory of design of airplanes; determination of forces and calculation of stresses in beams and trusses. Prerequisite: T. & A. M. 324. Winter. Rec. 3. Credit 3.

424. **Heating and Ventilation.** Theory, design, and layout of heating systems. The study of boilers, water heaters, ventilation, air analysis, and temperature control apparatus. Prerequisite: 344. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

425. **Advanced Airplane Structures.** A continuation of 420. Calculation for and proportioning of parts subjected to combined stresses. Practical and structural considerations. Prerequisite: 420. Spring. Rec. 3. Credit 3.

426. **Refrigeration and Air Conditioning.** Principles of refrigeration. The simultaneous control of temperature, humidity, and motion of air in buildings. Purification of air. Prerequisite: 424. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

428. **Automotive Transportation.** Automobile, bus, and truck transportation. Operating costs. Choice of equipment. Fleet operation. Operating and maintenance problems. Prerequisite: T. & A. M. 344. Fall. Rec. 3. Credit 3.

429. **Automotive Engine Design.** Problems in design and layout of high-speed engines of carburetion and Diesel types. Prerequisite: 445. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4.

430. **Automotive Engineering.** Power requirements of automobiles, busses, and trucks. Calculation of speed, acceleration, fuel consumption, braking and tractive efforts. Comparison of carburetion-engined and Diesel-engined vehicles. Prerequisite: 444. Winter. Rec. 3. Credit 3.

434. **Machine Tools.** The design and performance of machine tools. Production methods and development of special tools, jigs, and fixtures. Prerequisite: 237. 238, 310, 315. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

435. **Industrial Metallurgy.** Mechanical and thermal problems in the processing of industrial metals. Prerequisite: 440. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

440. **Fuels and Combustion.** Composition, properties, and combustion of fuels; fuel, gas, and lubricant testing. Prerequisite: 344. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

444. **Heat Engines.** The thermodynamics and performance of steam engines, turbines, gas compressors, and refrigeration machines. Reheating, regenerative, and binary cycles. Prerequisite: 344, 440. Fall. Rec. 4. Lab. 1, 3 hr. Credit 5.

445 **Internal Combustion Engines.** Thermodynamics and performance of gasoline and oil engines. Carburetion and fuel injection. Prerequisite: 440, 444. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

448. **Steam Power Plants.** Principal and auxiliary equipment for power, heating, and pumping plants. Cooling towers, boiler water treatment, principles of plant design. Prerequisite: 440, 444. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

455. **Time Studies.** Elements of production operations, quality of labor, time required, arrangement of equipment. Prerequisite: Credit or classification in 484. Fall, Winter, Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

466. **Power Plant Engineering.** Combustion of fuels; steam and Diesel prime movers; mechanical equipment of power, heating, and pumping plants; power costs For electrical engineering seniors. Prerequisite: 344. Fall. Rec. 5. Lab. 1, 3 hr. Credit 6.

467. **Power Plant Engineering.** A continuation of 466. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4.

484. **Industrial Organization.** Industrial tendencies, ownership; types of organization, executive control; wage systems, time studies, inspection methods, employment problems, labor turnover, personnel work, industrial relations. Prerequisite: Ec. 261. Fall, Winter. Lect. and rec. 3. Credit 3.

486. **Industrial Engineering.** Factory location and operation, orders and records, purchasing, storing, routing, scheduling, dispatching, costing, general management theories. Prerequisite. 484. Winter, Spring. Rec. 3. Credit 3.

489. **Factory Planning.** Selection and layout of machinery, power apparatus, heating, ventilating, and lighting systems; size and type of buildings. Prerequisite. 424. Spring. Rec. 1. Lab. 2, 3 hr. Credit 3.

600. **Advanced Machine Design Problems.** Mathematical and experimental analysis of problems in the field of dynamics of machinery, heat and heat flow, stress analysis, and vibration. The choice of work any quarter determined by the aptitudes and interests of the class. Mr. Norman.

624. **Aerodynamics.** Circulation and vortex theory of airfoils; airfoil characteristics; wind tunnel interference and scale effects; propeller theory. Fall. Credit 3 to 5. Mr. Bevan.

626. **Airplane Performance and Stability.** Calculation of airplane performance and economy at sea level and high altitudes. Calculations of stability and control. Spring. Credit 3 to 5. Mr. Bevan.

640. **Industrial Heating and Air Conditioning.** Theory and practice of plant and industrial heating, ventilation, and air conditioning. Fall. Credit 3 to 5. Mr. Norman.

645. **Applied Thermodynamics.** Thermal analysis and performance of steam engines, turbines, compressors, refrigeration machinery; heat generation and absorption. Fall, Winter. Credit 3 to 5. Mr. Cleghorn.

647. **Internal Combustion Engines.** Thermal analysis, performance, and design of internal combustion engines. Winter. Credit 3 to 5. Mr. Bevan, Mr. Brown.

655. **Research.** Messrs. Meeker, Cleghorn, Norman, Roudebush, Bevan, Hummel, Daasch, Brown.

678. **Central Stations.** Location and types; choice and arrangement of apparatus; coal conveying and storage systems. Power costs. Spring. Credit 3 to 5. Mr. Cleghorn.

685. **Factory Personnel.** Employment departments; time and wage problems; shop-committees; housing conditions and industrial relations. Fall. Credit 3 to 5. Mr. Roudebush.

688. **Manufacturing Costs.** Overhead and prime costs; machine-hour rate in distributing burden; departmental reports; graphical analysis. Fall, Winter, Spring. Credit 3 to 5. Mr. Roudebush.

MILITARY SCIENCE AND TACTICS

LT. COL. HERBERT R. ODELL, Head of Department

Associate Professors Major Hill, Major Haynes; Assistant Professors Capt. Warner, Capt. Matlack, Capt. Lewis, Lieut. Storke, Lieut. Van Giesen

For information concerning the Division of Industrial Science, see page 69.

Under the provisions of the National Defense Act, Iowa State College has secured from the United States Government authorization for the establishment of two units of the Reserve Officers' Training Corps, namely, Engineer and Field Artillery

The primary object of the Reserve Officers' Training Corps is to train selected students so that they may qualify for appointment as reserve officers in the Army of the United States. The training given will not only place the student in a position to be of service to his country in a national emergency, but will be valuable to him in his industrial or professional career.

The four-year course is divided into two parts. The first two years are known as the Basic Course and the last two as the Advanced Course.

CLASSIFICATION OF STUDENTS. A limited number of students taking Engineering are classified in the Engineer Unit; all others in the Field Artillery Unit.

BASIC COURSE. The Basic Course is required by the College as a prerequisite to graduation, of all physically fit male students who are citizens of the United States. Students who are excused from Military Science on account of physical disability must elect six credits of other work to take the place of Military Science. Upon the successful completion of the Basic Course the student may be enrolled in the Advanced Course, provided his application is approved by the Professor of Military Science and Tactics and the President.

ADVANCED COURSE. In the Junior and Senior years of some collegiate curricula given in the catalogue, certain courses are marked with a dagger (†). If a student is enrolled in the Reserve Officers' Training Corps, he may omit all or part of the courses thus marked, in each quarter, provided that in omitting these courses he does not omit more

credit hours than the Reserve Officers' Training Corps requires of him for the same quarter. If the omitted courses would exceed the number of hours required for the Training Corps, an elective must be taken which will bring the total number of hours for the quarter up to the requirements specified for that quarter in that curriculum.

Members of the Basic Course have their uniforms furnished by the Government; the uniform for the Engineer Unit consists of one cap, wool, overseas; one pair of chevrons and other sleeve insignia; one coat, wool, olive drab, with lapel of sky blue (blue dress trousers shade); one cravat or black tie; one insignia, collar, set; one shirt, flannel or cotton, olive drab; one pair trousers, wool; and one waist belt. The uniform for the Field Artillery Unit consists of one pair breeches, wool; one cap, wool, overseas; one pair of chevrons and other sleeve insignia; one coat, wool, olive drab, with lapel of sky blue (blue dress trousers shade); one cravat or black tie; one insignia, collar, set; one leggins, mounted; one shirt, flannel or cotton, olive drab; and one waist belt.

Members of the Advanced Course are allowed a cash commutation for the purchase of a tailor-made uniform. This is intended to cover the cost of a cap, coat, breeches, woolen shirt, and leather belt. Advanced Course students are also paid commutation of rations throughout the year, except for the 42 days they are at a required Summer Camp. At Camp, they receive the pay of a soldier of the seventh grade, free rations, medical attention, and five cents per mile travel allowance to camp and return, from the place from which they were authorized to proceed.

Description of Courses

ENGINEER

101, 102, 103. Organization of the Army; military discipline, courtesy and customs of service; military sanitation and first aid; national defense act; military history and policy; military obligations of citizenship; current international situation; leadership; rifle marksmanship; weapons and musketry; scouting and patrolling. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

201, 202, 203. Organization and duties of engineers; map and aerial photograph reading; military sketching; map making; rigging; leadership and command; scouting and patrolling; combat principles, the rifle squad. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

301, 302, 303. Interior guard duty; care of animals and stable management; military roads, location and construction; military roads, maintenance and repair; military bridging, general; military bridging, floating bridges; military explosives and demolitions; field fortifications, trenches; field fortifications, emplacements; field fortifications, obstacles; field fortifications, protected shelters; combat orders and solution of problems, engineer; combat principles of infantry units; combat principles of engineer units; mechanization; leadership; military bridges, fixed. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

401, 402, 403. Supply and mess management; emergency procurement and funds; organization and duties of engineers; construction in war; fixed bridges; combat principles, the company; organization of the ground; defense against chemical warfare; the law of military offenses; courts-martial; administration; military history and policy; leadership. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

FIELD ARTILLERY

121, 122, 123. Military fundamentals: Orientation, national defense act and R. O. T. C.; obligations of citizenship; military history and policy; current international situation; military discipline, customs and courtesy of service; military sanitation and first aid; military organizations and organization of the field

artillery. Leadership (Practical drills). Field artillery instruction: Elementary gunnery; duties of cannoneers and firing battery; field artillery ammunition and material. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

221, 222, 223. Leadership. Transport: Care of animals, stable management; equitation; driving and draft. Field artillery instruction: Fire control instruments; map and aerial photograph reading; battery communications; battery detail and reconnaissance, selection and occupation of position. Fall, Winter, Spring, respectively. Lecture 1. Drills 2. Credit 1 each course.

321, 322, 323. Leadership. Gunnery: Elementary ballistics and dispersion; preparation of fire; conduct of fire. Reconnaissance, selection and occupation of position: Duties of battery officers; the battery detail; field artillery communications; liaison with infantry. Transport: Equitation; driving and draft; automotive vehicles. Pistol marksmanship. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

421, 422, 423. Leadership: Command and instruction student organizations; transport (animal). Tactics: military history and policy; military law and adminstration. Fall, Winter, Spring, respectively. Lectures 2. Drills 3. Credit 3 each course.

MINING ENGINEERING

See page 142.

MODERN LANGUAGES

LOUIS DE VRIES, Head of Department

Assistant Professors Kehlenbeck, Marlow, *Towne

For information concerning the Division of Industrial Science, see page 69.

Regular elementary work is offered in French, German, and Spanish. Students in the Division of Industrial Science are required to study either French or German, while students from other divisions may elect whatever language they prefer.

Courses in Reading Knowledge in French and German are offered to students in Chemical Technology; these courses are also elected by senior college students of the other divisions who desire to become acquainted with the literature in their field; the courses were originally designed for graduate students who wanted to learn to read French and German as rapidly as possible, so that they might have access to the foreign literature in their research work. Emphasis is constantly placed on accurate translation. A knowledge of the foreign literature may avoid duplication of work done abroad.

A foreign language is not only a useful tool for the expressing and gathering of ideas, but the study of the literature, culture, and institutions of a foreign people, broadens one's intellectual horizon, and increases one's human sympathy and understanding, a development which American students especially need.

Description of Courses

201, 202, 203. **Elementary French.** Principles of pronunciation; grammar; reading of modern prose. Fall, Winter, Spring. Rec. 3 to 5. Credit 3 to 5 each course.

231, 232, 233. **Elementary German.** Grammar, reading, composition and conversation. Fall, Winter, Spring. Rec. 3 to 5. Credit 3 to 5 each course.

*Absent on leave.

261, 262, 263. *Elementary Spanish. Grammar, reading, composition, and conversation. Fall, Winter, Spring. Rec. 2 to 5. Credit 2 to 5 each course.

301, 302, 303. **Intermediate French.** Reading of modern French prose, plays, and some verse; grammar review and composition; conversation. Prerequisite 203 Rec. 3 to 5. Credit 3 to 5 each course.

311, 312, 313. **Contemporary French Literature.** Prerequisite. 203. Rec. 2 to 4. Credit 2 to 4 each course.

316. **Scientific French.** Selected readings in physical, chemical, biological, and geological subjects. Prerequisite: 203 or equivalent. Rec. 3. Credit 3.

331, 332, 333. **Selected German Reading.** Prose reading followed by a drama. Prerequisite: 233. Rec. 3 or 4 each course.

341, 342, 343. **Scientific German.** Selected readings in physical, chemical, biological and geological subjects. Prerequisite 233 or equivalent. Rec. 3. Credit 3.

361, 362, 363. *Intermediate Spanish. Reading of modern Spanish prose; grammar review and composition, conversation. Prerequisite: 263. Rec 2 to 4. Credit 2 to 4 each course.

371, 372, 373 *Commercial Spanish. Reading of Spanish-American commercial literature. Writing commercial letters and reports. Conversation. Prerequisite 263. Rec. 3. Credit 3 each course.

411, 412, 413. **Reading Knowledge of French.** No prerequisite Credit 2 to 4 each quarter for undergraduates May be taken by graduate students without credit.

441, 442, 413. **Reading Knowledge of German.** No prerequisite. Credit 2 to 4 each quarter for undergraduates May be taken by graduate students without credit

MUSIC

TOLBERT MACRAE, Head of Department

Associate Professor Hawley; Assistant Professor Edgar; Instructors Cook, Niemack, Schroeder

For information concerning the Division of Industrial Science, see page 69.

The aim of the Department of Music is to afford students who have interest in music a means of developing their musical ability. An opportunity is offered for active participation in various branches of music according to the interest of the individual.

The Department of Music is housed in a brick building, situated near the center of the campus. This building contains teaching studios and practice rooms. Each practice room is equipped with a piano and is well lighted. Rehearsals of the various musical organizations are held in Music Hall, Morrill Hall, and in room 403, Botany Building.

Description of Courses

Iowa State College Festival Chorus. Glee Clubs. All members of the student body and the faculty are eligible Interpretation of choral work, secular and sacred.

101, 102, 103. **Harmony.** Ear training and sight reading. Course designed to teach pupils scales, intervals, chords, and rhythms used in composition. Each course is two periods weekly. This will prepare students for writing melodies and making their own harmonization without use of piano or other instrument and should prepare them to do sight reading either instrumental or vocal Credit 1 each course See page 293 for fee

111, 112, 113. **Band.** Open to all students by competitive examination. Concerts are given by the organization in addition to playing for convocations and for athletic events. Members doing satisfactory work receive 1 credit per course.

121, 122, 123. **Training Band.** Open to all students by competitive examination. Work done in this band is preparatory to entrance to the concert band. Members will play at athletic events.

*May not be offered in 1936-37.

131, 132, 133. **Ensemble Class.** For band and orchestral instruments. A valuable course for students as they will learn through ensemble practice the relation of instruments to each other and the absolute rythmic value of all combinations of notes. This course is designed to prepare students for advanced band and orchestra. See page 293 for fee.

141, 142, 143. **Glee Club.** (Men and women.) Open to all students by competitive examination. The clubs give several concerts each year and assist at college functions. Three rehearsals are required each week. Members doing satisfactory work will receive one credit each course.

144. **Music Appreciation.** Designed to acquaint the students with the form and meaning of good music. Lectures demonstrated by musical selections. Open to all students. Fall, Winter, Spring. Rec. 2. Credit 1.

151, 152, 153. **Orchestra.** Designed for students who have made a beginning on an orchestral instrument. Standard orchestral works are given in concert during the year. Fall, Winter, Spring, respectively. Credit 1 each course.

311, 312, 313. **Private Music Lessons.** Open to all students. Satisfactory work being done in private instruction in any branch of music will be given one credit each course. See page 293 for fee.

Not more than 8 total credits in music will be allowed toward graduation.

PHYSICAL EDUCATION (For Men)

G. F. VEENKER, Head of Department

Associate Professors Menze, Otopalik, Simpson; Assistant Professors Daubert, Schmidt, Truskowski; Instructors Timm, Wells, Yeager

For information concerning the Division of Industrial Science, see page 69.

The work of the department includes required courses for Freshmen and Sophomores, elective courses for upperclassmen, intramural athletics, and intercollegiate athletics. The department is committed to the principle that its work should be mainly for the many rather than the few, and that the development of special teams is of secondary importance to the development of the student body as a whole.

THE REQUIRED COURSES for Freshmen and Sophomores aim to remedy common physical defects, with special attention to faulty posture, to foster a condition of vigorous health and proper health habits, and to give a fundamental training which will develop motor skill, endurance, strength, self-control, and self-confidence. It is intended also to give a knowledge of and an interest in forms of physical activity in which one can participate after graduation, as well as during the later years of college life.

Through the **intramural athletics**, every man is given an opportunity and an incentive to participate in competitive athletics. The intramural program includes football, touch football, softball, basketball, volleyball, wrestling, tennis, indoor and outdoor track, handball, horseshoe pitching, baseball, golf, archery, fencing, and swimming.

INTERCOLLEGIATE ATHLETICS are under the control of the Athletic Council. The Iowa State College is a member of the Missouri Valley Intercollegiate Athletic Association, and the intercollegiate athletics are subject to the rules of this conference.

The College is also a member of the National Collegiate Athletic Association and is committed to tolerate only clean and wholesome sport and to promote good sportsmanship among contestants and spectators.

The College is represented by intercollegiate teams in football, cross country, basketball, wrestling, swimming, indoor and outdoor track, baseball, tennis, golf, and polo.

Curriculum in Industrial Science—Major in Physical Education (in combination with another major)

Athletic coaches and teachers of Physical Education in Iowa high schools are usually required to teach some academic subject in addition to their athletic work. The department offers a Major in Physical Education combined with a Major in another Industrial Science Department.

For the Freshman and Sophomore years, see page 226.

For general instructions as to Junior and Senior work, see page 227.

Description of Courses

101, 102, 103. **Physical Education.** Mass activities, corrective exercises, swimming, athletics and games. Fall, Winter, Spring, respectively. Lab. 2, 1 hr. Required each course.

101C, 102C, 103C. **Individual Physical Education.** On recommendation of the Hygiene Department in substitution for 101, 102, 103. Fall, Winter, Spring, respectively. Lab. 2, 1 hr. each course.

106, 107, 108. **First Aid and Safety.** (106) First aid to the injured. Open to men and women. The First Aid Certificate of the American Red Cross will be given to those who satisfactorily complete this course. Spring. (107) Advanced first aid and safety. (108). Teacher training in first aid and safety. Lect. 2. Credit 2 each course.

201, 202, 203. **Physical Education.** Advanced work. Prerequisite: 101, 102, 103. Fall, Winter, Spring, respectively. Lab. 1, 1 hr. Required each course.

201C, 202C, 203C. **Individual Physical Education.** On recommendation of the Hygiene Department in substitution for 201, 202, 203. Fall, Winter, Spring. Lab. 1 1 hr. each course.

304, 305, 306. **Physical Education Technique.** Instruction and practice in fundamental skills of physical education activities. (304) Football. Fall. (305) Basketball. Winter. (306) Track. Spring. Lab. 6. Credit 2 each course.

309. **Athletic Training.** Principles governing conditioning for various sports; diet, sleep, bathing, massage; overtraining; prevention and care of injuries. Prerequisite: 201, 202, 203. Spring. Rec. 2. Credit 2.

314, 315, 316, 317. **Coaching of Athletic Sports.** History, rules, theory, coaching methods. Prerequisite: 201, 202, 203. (314) Football. Winter. (315) Basketball. Winter. (316) Track. Spring. (317) Baseball. Spring. Lecture and demonstration 3. Credit 2 each course.

411, 412, 413. **Supervised Teaching in Physical Education.** (Voc. Ed. 411, 412, 413.) Practice with school and college groups. Fall, Winter, Spring, respectively. Lab. 6. Credit 1 or 2 each course.

424. **Special Topics.** Credit 2. Hours as arranged.

491. **Principles of Physical Education.** (Voc. Ed. 491.) Interpretation of objectives of physical education and health education. Analysis of activities in terms of developmental objectives. Prerequisite: Zool. 255, Voc. Ed. 304. Fall. Rec. 3. Credit 3.

492. **Methods of Teaching Physical Education.** (Voc. Ed. 492.) Application of general education methods to physical education. Special methods of teaching activities not covered in 314, 315, 316, 317. Prerequisite: Psych. 334, 335. Winter. Rec. 3. Credit 3.

493. **Organization and Administration.** (Voc Ed. 493.) Organization and administration of physical education and athletics. Program for required and elective courses, intramural and interschool athletics. Athletic management. Prerequisite: 201, 202, 203. Spring. Lect. 3. Credit 3.

PHYSICAL EDUCATION (For Women)

WINIFRED R. TILDEN, Head of Department

Assistant Professor Foster; Instructors Hassinger, Hopkins, Moorehouse

For information concerning the Division of Industrial Science, see page 69.

Two years of Physical Education are required of all women students in three one-hour periods. Classification in any of the courses listed in the group which may be taken for the required work will be determined by the abilities and skills of each student.

PHYSICAL EXAMINATION. After matriculation each student has a physical examination and has her silhouetteograph taken. The type of work permitted will depend upon the result of these examinations.

INDIVIDUAL PHYSICAL EDUCATION. Those students whose physical examinations and silhouetteographs indicate they should be restricted in some activity will be assigned to Individual Physical Education, and will remain so classified until released from the restrictions. The Department of Hygiene co-operates closely with the Departn ent of Physical Education in making these assignments.

SWIMMING. Every student is required to pass a swimming test (Phys. Ed. 400) before her graduation unless excused by the College Physician or Head of the Physical Education Department. Opportunity for advanced swimming is given in the Women's Athletic Association, Red Cross Life Saving Corps and the honorary swimming club—The Naiads.

WOMEN'S ATHLETIC ASSOCIATION. The Women's Athletic Association is affiliated with the Athletic Federation of College Women, the National Field Hockey Association and the Women's Division of the National Amateur Athletic Federation.

INTRAMURALS. Intramural activities, volleyball, ring toss, archery, badminton, basketball, swimming, and ping pong, are offered to the girls in all houses and dormitories who like to participate in some sport after four o'clock in the afternoon. The enjoyment derived is its reward.

UNIFORMS. The uniforms shall consist of a one-piece sleeveless romper suit of any color and of any washable material, white tennis shoes and socks. This may be used for all physical education activities except swimming. For swimming, a cotton tank suit, any color except red, and a bathing cap are required. These articles may be purchased before or after matriculation.

THE REQUIRED COURSES have a three-fold purpose: (1), to correct common physical defects; (2), to develop co-ordination and bodily control; and (3), to give each student a fundamental training in motor skills and abilities which she may use for her own enjoyment and development and for those with whom she may work and live.

Description of Courses

Six quarters of work from courses 121, 122, 123, 221, 222, 223, may be chosen for the required work. One credit will be given for each three quarters of the required courses.

*121, 122, 123; 221, 222, 223. **Physical Education.** **Elementary rhythm; folk dancing and games; natural dancing; tap dancing; archery; badminton; basketball; golf; hockey; ring toss; kittenball; **swimming; life saving; tennis; volley ball.

121C, 122C, 123C; 221C, 222C, 223C. **Individual Physical Education.** On recommendation of the department of Hygiene and Physical Education in substitution for 121, 122, 123; 221, 222, 223.

400. **Swimming Test.** Required of all women for graduation unless excused by the College Physician or the Head of the Department of Physical Education.

Elective Credit Courses

106. **First Aid.** See Physical Education for Men, page 249.

324. **Physical Education.** Any activity in 121, 122, 123 may be taken for 1 credit if the activity has not been taken as a required course.

326. **Camp Fire.** History, administration and program of the Camp Fire Girls organization. Discussion and practice of the activities included in the program Prerequisite: three quarters of required physical education or equivalent. Alternate years. Offered Spring, 1937. Lect. 1. Lab. 1, 3 hr. Credit 2.

327. (Voc. Ed. 327) **Theory and Practice of Coaching.** Survey of coaching field. Coaching technique and officiating. Application of rules, plays and coaching principles. Alternate years. Offered Winter, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3.

328. (Voc. Ed 328.) **Special Problems in Teaching Physical Education.** Alternate years. Offered Winter, 1937. Lect. 2. Lab. 1, 3 hr. Credit 3.

PHYSICS

J. W. Woodrow, Head of Department

Professors Fox, Spinney; Associate Professors Carr, Kunerth, Plagge, Stiles; Assistant Professors Atanasoff, Benedict, Butler, McCracken, Richards, Willson; Instructors Miller, Pinney; Fellows Countryman, Frederick, Goodwin, Higgins, Ryan, Stebbins, Wilson; Instrument Maker Larsen; Technician Baughman

For information concerning the Division of Industrial Science, see page 69.

The Physics building has been designed and constructed to meet the special requirements of lecture, class room and laboratory work in physics It provides more than fifty thousand square feet of floor area and is equipped with modern conveniences and facilities for instruction and investigation in this field.

Curriculum in Industrial Science—Major Physics

For the Freshman and Sophomore years, see page 226.

For general instruction as to senior college work, see page 227.

*121, 122, 123 refer to the first year of required work, 221, 222, 223 to the second year.

**To be chosen if not previously taken here or elsewhere.

Description of Courses

106. **Physics for Home Economics Students.** The principles of physics as applied to the home. Fall, Winter, Spring. Lect. 2. Rec. 2. Lab. 1, 3 hr. Credit 4.

204. **Physics for Agricultural Students.** The various kind of energy involved in plant and animal production and some of the newer methods of energy control. Prerequisite: Math. 102 or 205. Fall, Winter, Spring. Lect. 2. Rec. 1. Credit 3.

211, 212, 213. **General Physics.** For students in Industrial Science. Prerequisite: Math. 102. Fall, Winter, Spring, respectively. Lect. and rec. 3. Lab. 1, 2 hr. Credit 4 each course.

221, 222, 223. **General Physics.** For Engineering students. Mechanics, heat, magnetism, electricity, sound, and light. Prerequisite: Math. 102. (221) Fall, Winter. (222) Winter, Spring. (223) Spring, Fall. Rec. and demonstration 4. Lab. 1, 2 hr. Credit 5 each course.

301, 302, 303. **General Physics.** For Home Economics students. An advanced course in fundamental physics with special applications to household problems. Sufficiently fundamental to afford thorough training for teachers. Prerequisite: H. Eq. 154. Fall, Winter, Spring, respectively. Lect. 1. Rec. 2. Lab. 1, 3 hr. Credit 4 each course.

311, 312, 313. **Physical Measurements.** Precise measurements in mechanics, heat, optics, and electricity. (311) Mechanics. (312) Heat, optics, and electricity. (313) Electricity. Prerequisite: 213 or 223, Math. 213. Fall, Winter, Spring, respectively. Lab. 1, 3 hr. Credit 1 each course.

316. **Photography.** Methods and practices in photography. Composition and lighting. Corrective treatment of negatives. Printing. Prerequisite: 204, Chem. 103, or their equivalents. Fall, Spring. Lect. and rec. 1. Lab. 2, 3 hr. Credit 3.

321, 322, 323. **Advanced General Physics.** Mechanics, heat, optics, and electricity. Prerequisite: 213 or 223, Math. 213, Chem. 103. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course.

404. **History of Physics.** Prerequisite: 213 or 223. Spring. Credit 2.

405. **Laboratory Glassblowing.** Exercises with the table blast lamp selected to include operations fundamental to the making of laboratory glassware. Methods of cutting tubing. Demonstrations with Pyrex. Prerequisite: senior college classification. Fall, Winter, Spring. Lab. 2, 1½ hr. Credit 1.

415. **Advanced Glassblowing.** Seals not included in 405. Work with Pyrex and special glasses. Ground joints, stopcocks, manometers, vacuum apparatus, and electrical glassware. Construction and use of electric furnaces for annealing glass and other laboratory purposes. Prerequisite: 405. Fall, Winter, Spring. Credit 1 to 3.

450. **Advanced Physics Laboratory.** Prerequisite: 313, or equivalent. Fall, Winter, Spring. Credit 1 to 9 in any one year.

498. **Teaching of Physics.** (Voc. Ed. 498.) A technique course. To acquaint prospective teachers with the recent educational advances in methods as they apply to the teaching of physics. A study of the content of the high school physics, and practice in presentation of various topics. Prerequisite: 15 credits of physics, including 211, 212, 213, or equivalent. Winter. Lect. and rec. 3. Credit 3.

501, 502, 503. **Industrial Physics.** Discussion of recent physics research as applied to industrial problems. The current topic is the thermionic vacuum tube. Prerequisite: 213, Math. 213. Fall, Winter, Spring, respectively. Lect. and rec. 2. Credit 2 each course.

504. **Heat.** Temperature, expansion, specific heat, convection, conduction, gas laws, kinetic theory, change of state, radiation, isothermal and adiabatic changes, measurements of high and low temperatures. Prerequisite: 213 or 223, Math. 213. Spring. Lect. and rec. 3. Lab. 0 or 1, 3 hr. Credit 3 or 4.

505, 506. **Wave-Motion and Sound.** General theory of wave-motion and vibrating systems, resonance and interference; physical characteristics of some musical instruments; acoustics of speech and hearing; measurement of sound absorption; acoustic correction of auditoriums. Prerequisite: 213 or 223, Math. 213. Winter, Spring, respectively. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3 each course.

514. **Geometrical Optics.** Optical constants of mirrors and lenses, image formation, vision through a lens, aberrations, optical instruments, lens combinations. Prerequisite: 213 or 223, Math. 213. Fall. Lect. and rec. 3. Lab. 0 or 1, 3 hr Credit 3 or 4.

515. **Illumination.** Illuminants, methods of production of light, photometry, illumination measurements, lighting design, brightness, glare, color, the eye, practical applications. Prerequisite: 223 and 313. Winter. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

516. **Physical Optics.** Wave theory, absorption, dispersion, interference, diffraction, gratings, resolving power, polarization. Prerequisite: 213 or 223, Math. 213. Winter. Lect. and rec. 3. Lab. 0 or 1, 3 hr. Credit 3 or 4.

519, 520. **Modern Experimental Physics.** (519) Physical units, theory of measurements, formulation of physical equations. Measurement of electronic mass and charge. Fall. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3. (520) Special problems in electron phenomena, conduction of electricity through gases, and spectroscopy. Prerequisite: 313, 405, or equivalents, and permission of the instructor. Winter. Lect. and rec. 1. Lab. 2, 3 hr. Credit 3.

524, 525. **Biophysics.** Electromagnetic waves and other physical phenomena and their relation to plant and animal life. Prerequisite: 213 or 223. Winter, Spring, respectively. Rec. 3. Credit 3 each course.

534. **X-rays.** Sources, absorption, scattering, reflection by crystals, continuous and line spectra, quantum relations and energy levels, spectral series, X-ray spectrometry. Prerequisite 323, or equivalent. Spring. Lect. and rec. 3. Credit 3.

594, 595. **Electricity and Magnetism.** Electrostatics, magnetostatics, steady currents, networks, chemical and thermal effects, electromagnetism, electric and magnetic instruments, induction, dielectrics, magnetic materials, electromagnetic waves. Prerequisite: 323. Fall, Winter, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Willson.

607. **Theory of Alternating Currents.** Analytical, graphical, and complex quantity methods for a.c. circuit problems. Series and branched circuits having resistance, inductance, and capacitance. Resonance potentials and other frequency effects. Prerequisite: 594. Alternate years. Offered Spring, 1938. Lect. and rec. 3. Credit 3. Mr. Spinney.

610. **Seminar.** Credit 1 each time taken. Mr. Woodrow.

611, 612, 613. **Applied Light and Radiation.** Polarized light and applications, spectroscopy, Balmer series, Zeeman effect, nature of light, mechanical equivalent of light, cosmic rays, black body laws, radiation, pyrometry. Prerequisite: 516. Alternate years. Offered Fall, Winter, Spring, 1937-38. Lect. and rec. 3. Credit 3 each course. Mr. Kunerth.

614, 615. **Kinetic Theory.** Ideal gases, Maxwell's velocity law, molecules with dimensions, transport problems, change of state, equation of Van der Waals, vaporization, solutions, dissociation, condensation. Prerequisite: 504, Chem. 625, or equivalent. Fall, Winter, respectively. Lect. and rec 3. Credit 3 each course Mr. Atanasoff.

620. **Research.** Messrs. Woodrow, Fox, Spinney, Carr, Kunerth, Stiles, Atanasoff, McCracken, Richards.

624, 625. **Electron Theory.** Theory of conduction through gases; glow, arc, and spark discharges; ionization processes and impact phenomena; atomic and molecular energy levels. Prerequisite: 595 or equivalent. Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Fox.

637, 638. **Advanced Theory of Electric Oscillations and Electric Waves.** Prerequisite: 607. Fall, Winter, respectively. Alternate years. Offered 1936-37. Lect. and rec. 2. Credit 2 each course. Mr. Richards.

640. **Advancd Technical Physics.** Recent developments in the various fields of modern physics, with special emphasis on their applications. Prerequisite: 504, 516, 595, or equivalent. Credit as arranged. Messrs. Woodrow, Fox, Carr, Kunerth, Stiles, Atanasoff, Richards.

650. **Photography in Scientific Work.** Methods of photography in specialized fields; choice of filters and plates; photomicrography; color photography. Prerequisite: 316 and permission of the instructor. Winter. Lab. 2, 3 hr. Credit 2 each time taken. Mr. Carr.

651, 652, 653. **Introduction to Mathematical Physics.** (Math. 651, 652, 653.) Basic mathematics used in theoretical physics. Fundamental topics of classical and modern physics using mathematical concepts and methods. Prerequisite: 504, 516, 605, Math. 314. Fall, Winter, Spring, respectively. Lect. and rec. 3. Credit 3 each course. Mr. Atanasoff.

681, 682, 683. **Quantum Mechanics.** (Math. 681, 682, 683.) Newer developments in the quantum theory and their application to problems in physics and chemistry. Prerequisite: 323, Math. 315. Fall, Winter, Spring, respectively. Alternate years. Offered 1937-38. Lect. 3. Credit 3 each course. Mr. Atanasoff.

PSYCHOLOGY

J. E. EVANS, Head of Department

Professor Vance; Associate Professors Fritz, Gaskill, Lauer

For information concerning the Division of Industrial Science, see page 69.

Every vocation that involves the human element is of necessity founded on psychological principles. It is for this reason that the various courses offered by the department are formulated from the point of view of the practical needs of students in the industrial and vocational fields.

Psychology has the following aims: (1) To give fundamental information concerning one's self; (2) To aid in a more accurate understanding of other people; (3) To present the essential psychological principles underlying effective teaching and to give a scientific appreciation of child behavior in its relation to parental problems; (4) To apply the principles of psychology to the human element in business and industry.

Description of Courses

Note. Psychology 204, 334 or 634, 434 are required toward the state teachers' certificate. See State Teachers' Certificate, page 281.

105. **How to Study.** Methods of mental efficiency. Principles underlying successful study, class room procedure, and examinations. A help class for those needing assistance. Fall and Winter for one-half term with two recitations and one period each week for conference For freshmen and sophomores only. Rec. 2. Credit 1.

110. **Social Ethics.** Application of standards of social conduct to daily life Fall. Six lectures. Required. For freshman women. Miss Sims.

204. **General Psychology.** Study of normal human behavior. Fundamental to all other courses in Psychology. Fall, Winter, Spring. Rec. 3. Credit 3.

206. **Laboratory in General Psychology.** A laboratory course paralleling or following 204. Rec. 1. Lab. 1, 2 hr. Credit 2. Spring.

320. **Special Problems.** Prerequisite: 5 credits in psychology, including elementary psychology, and permission of the head of the department. Fall, Winter, Spring. Credit 1 or 2 each quarter. Limit 5 credits.

334. **Educational Psychology.** The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite. 204. Fall, Winter, Spring. Rec. 3. Credit 3.

335. **Educational Psychology.** The treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334. Winter, Rec. 3. Credit 3.

410. **Psychology of Skill.** The development of skill and skill techniques. Habit making and breaking; transfer of training and its principles; mechanical aptitudes and intelligence. Principles of motivation effective in the shop; development of muscular co-ordination. Laboratory methods and demonstrations. Prerequisite: 204. Alternate years. Offered Winter, 1937. Rec. 3. Credit 3.

414. **Psychology of the Family.** A study of the development of the affections, mutual relationships; analysis of personal likes and dislikes; emotional development and psychological maturity; a consideration of conservation of energy, and personal efficiency, analysis of family leisure. Prerequisite· 204, Ec. 385. Alternate years. Offered Spring, 1937. Rec. 3. Credit 3.

415. **Childhood and Adolescence.** Behavior of children with special reference to the pre-school age; critical changes of early adolescence. Development from the point of view of the parent. One hour each week of observation of children required. Prerequisite: 204. Fall, Winter, Spring Rec. 3. Cerdit 3.

416. **Advanced Child Psychology.** Psychological technique necessary to handle the pre-school child. For those dealing with the young child either individually or in groups. Prerequisite· 415 Fall. Rec. 3. Credit 3.

420. **Special Topics.** Prerequisite: 9 credits of psychology and permission of the head of the department.

424. **Social Psychology.** Psychology of people in consequence of their associations; the crowd mind, the mob and other crowds; public opinion and propaganda. Prerequisite: 6 credits of psychology including Psych. 204. Winter. Rec. 3. Credit 3.

426. **Psychology of Personality.** Principles underlying personality development, and personality measurement. Analysis of personality traits, development of interest. Personality in its relation to effective speaking and writing. Prerequisite: 204. Spring. Rec. 3. Credit 3.

428. **Psychology of Religion.** The facts of psychology which relate to religion. The contributions of psychology to a working faith. Prerequisite: 204. Alternate years. Offered Winter, 1938. Rec. 2. Credit 2. See also Religious Education, page 257.

433. **Test and Measurement Interpretation.** Development of ability to interpret the measurement methods and quantitative principles used in educational, psychological and vocational literature. Prerequisite: 6 credits of psychology. Winter. Rec. 3. Credit 3.

434. **Tests and Educational Measurement.** Treatment of tests and their application in educational, vocational, and industrial guidance and selection. Important for teachers, employers, and vocational counselors. Prerequisite: 204. Fall, Spring. Rec. 3 Credit 3.

438. **Psychology of Guidance and Vocational Selection.** General analysis of work, principles of self-analysis for vocational guidance. Principles of guidance for teachers. Prerequisite: 204. Spring. Rec. 2. Credit 2.

444. **Abnormal Psychology in Relation to Industrial Problems.** The various types of abnormal mentality and mental disorders in their relation to industry; the significance and importance of mental hygiene and occupational therapy in modern life. Prerequisite: 6 credits of psychology. Spring. Rec. 3 Credit 3.

454. **Psychology and its Application.** A survey of the applications of psychology. Individual differences, character and temperament, disordered minds, crime, mental efficiency, integration of self, emotions, tests and test results, group minds, public opinion, leadership, success, psychology and the professions. Prerequisite: 204. Winter. Rec. 4. Credit 4.

464. **Industrial Psychology.** The human element in industrial and vocational problems; classification and handling of men. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3.

468. **Laboratory Course in Industrial Psychology.** Laboratory investigation of fatigue, rest periods, optimum periods of work, habit formation, and motor coordination, industrial tests, etc. Prerequisite: 6 credits of psychology. Alternate years. Offered Fall, 1937. Laboratory 2. Rec. 1. Credit 2.

474. **Psychology of Safety.** Safety analyzed from the standpoint of the individual. Observation of techniques used in diagnosing accident-proneness. The relation of fatigue, health, attitudes, sensory defects, emotional instability and intelligence to accident causation. Educational methods for reducing accidents. Designed for educational directors, safety engineers, industrial workers, and others interested in public safety. Prerequisite. 6 credits of psychology. Alternate years. Offered Spring, 1937. Rec. 3. Credit 3.

484. **Psychology of Advertising.** Principles of psychology that relate to advertising. Prerequisite. 204. Fall, Winter, Spring. Rec. 3. Credit 3.

485. **Psychology of Salesmanship.** The principles of psychology that relate to selling. Prerequisite: 6 credits of psychology including Psych. 484. Winter. Rec. 3. Credit 3.

488. **Psychological Influences Underlying Economic Problems.** Analysis of the fundamental motives and wants in economic problems. Prerequisite: 204, and 6 credits of Economics and History. Alternate years. Offered Fall, 1937. Rec. 3. Credit 3.

496. **Seminar in Industrial Psychology.** Investigation of problems. Seniors and graduates only. Prerequisite: 6 credits of psychology, and permission of the head of the department. Fall, Winter, Spring. Credit 1 to 4 each quarter. Limit 9 credits.

620. **Research.** Messrs. Evans, Vance, Fritz, Lauer, Gaskill.

634. **Educational Psychology.** The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite: 204. Fall, Winter, Spring Rec. 3. Credit 3. Graduates who have not had 334. Messrs. Lauer, Fritz.

635. **Educational Psychology.** The treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334 or 634. Winter. Rec. 3. Credit 3. Graduates who have not had 335. Messrs. Lauer, Fritz.

636. **Educational Psychology.** A critical view of the psychology of mass education as it concerns group action, crowd behavior, co-operation, social participation; psychology of modern leisure and culture. Prerequisite: 334 or 634. Alternate years. Offered Fall, 1936. Rec. 3. Credit 3. Mr. Evans.

PUBLIC SPEAKING

GUY S. GREENE, Head of Department

Professor Shattuck; Assistant Professors Lenrow, Wallace, Whan; Instructor Stone

For information concerning the Division of Industrial Science, see page 69.

The instruction offered by this department is designed to give the student a knowledge of the principles underlying effective oral communication and an opportunity for frequent practice in the application of those principles. To this end the department offers courses of two main types: those dealing with the composition and delivery of original speeches, and those dealing with the oral interpretation of literature. Courses of the first type are 311, 312, 313, 334, 335, 424, and 434; courses of the second type are 254, 255, 361, 362, 363, 474, and 475.

Graduates often find opportunities to direct the work of school and community dramatic organizations or debating teams. For students who wish to fit themselves for such work, the department suggests the following sequences: for dramatic production, 104, 254, 361, 474, 475; for debating, 104, 311, 312, 334, 335.

Students who wish to offer public speaking as a minor are required to complete a minimum of 15 credits of work in the department, including courses 104, 254, 311, and 312.

This department, with the co-operation of the Departments of Hygiene and Psychology and the Committee on English, maintains a speech clinic, the purpose of which is to deal with individual speech problems. The services of the clinic are available to all students.

Description of Courses

104. **Voice and Speech.** Principles of voice production and enunciation; standards of pronunciation. Practice for improvement of habits of speech based upon needs of individual students. Fall, Winter, Spring. Rec. 2. Credit 2.

254, 255. **Oral Reading.** (254) Principles of oral interpretation of literature; practice in reading aloud. Fall, Winter, Spring. (255) Methods of interpretation of poetry; practice in critical analysis and oral interpretation of lyric and dramatic poems. Spring. Rec. 3. Credit 3 each course.

311, 312, 313. **Extempore Speaking.** Prerequisite: Engl. 103. (311) Fundamental principles of public speaking; frequent practice in composition and delivery of short extemporaneous speeches; emphasis upon methods of exposition. Fall, Winter, Spring. (312) Continuation of 311; emphasis upon methods of persuasion and problems of delivery. Fall, Winter, Spring. (313) Study of various types of speeches; practice in composition and delivery of types suited to needs of individual students. Winter, Spring. Rec. 2 or 3. Credit 2 or 3 each course.

334, 335. **Argumentation and Debate.** Prerequisite: 311, or permission of instructor. (334) Study and application of principles of conviction; practice in composition and delivery of debate speeches. Fall, Winter, Spring. (335) Continuation of 334; study and application of principles of persuasion; practice in debating. Spring. Rec. 3. Credit 3 each course.

361, 362, 363. **Play Selection.** Study of plays with attention to principles of production. Practice in reading plays to develop appreciation and to aid in selection for amateur production. Prerequisite: permission of instructor. (361) Fall, Winter, Spring. (362) Winter. (363) Spring. Credit 3 each course.

424. **Group Discussion.** Principles of group discussion, including parliamentary procedure; practical application of principles through discussion of current problems of local and general interest. Prerequisite: 312, or permission of instructor. Spring Credit 3.

434. **Debating.** Preparation for and participation in intercollegiate debates. Open only to members of intercollegiate debating teams recommended by the instructor. Prerequisite: 335. Winter, Spring. Credit 3.

474, 475. **Dramatic Production.** Prerequisite: 254 or 361, or permission of instructor. (474) Principles of play production, including casting, rehearsing, acting, staging, lighting, and make-up; practice in presenting plays. Fall, Winter, Spring. (475) Theory and practice of stagecraft; design and construction of scenery and technique of lighting. Spring. Credit 3 each course.

RELIGIOUS EDUCATION

NELSON P. HORN, Head of Department

For information concerning the Division of Industrial Science, see page 69.

The work of this department is carried on as a means of helping students in correlating their religious thinking with points of view which naturally develop as they study the various sciences. The studies offered are open only to students regularly enrolled in the College.

Description of Courses

324. **An Introduction to the Bible.** The message of the Bible in the light of its historical background and development. Fall, Spring. Rec. 3. Credit 3.

326. **The Growth of Christianity.** An appreciation of some of the leading persons and the significance of the principal events and trends in the development of Christianity. Winter. Rec. 3. Credit 3.

329. **The Religions of Mankind.** A study of the various religions of the world. Fall, Spring. Rec. 2. Credit 2.

434. **Social and Ethical Teachings of Jesus.** Present day Christianity—its relation to the teachings of Jesus and its bearing upon modern life. Winter, Spring. Rec. 2. Credit 2.

437. **The Meaning and Purpose of Life.** The guiding principles of human life. How discovered. How used as possibilities for promoting the greatest values. Fall, Winter. Rec. 2. Credit 2.

439. **Methods of Religious Work.** A study of typical programs of present day religious work together with practice in program building. Winter, Spring. Rec. 2. Credit 2.

RURAL SOCIOLOGY

For work in Rural Sociology, see Agricultural Economics, page 104, and Economics, page 167.

SOILS

(Sub-Department of Agronomy.)

For description of courses, see page 119.

TECHNICAL JOURNALISM

BLAIR CONVERSE, Head of Department

Assistant Professors Beckman, Marvin; Instructor Goeppinger; Graduate Assistants Lovrien, Seaman

For information concerning the Division of Agriculture, see page 58.

Instruction in technical journalism is offered to all students and adapted as far as possible to their various needs. Its purpose is twofold: to serve those professionally interested in technical journalism and to aid those wishing less extensive work.

To "professional" students it offers training for editorial positions with the technical, business and trade press, for advertising positions with such publications and with industries, and for rural community journalism. To these ends it offers:

1. A four-year curriculum in Agricultural Journalism.
2. A major sequence in journalism for students of Home Economics.*
3. A sequence of journalism subjects which may be elected by students of Engineering.**
4. Groups of journalism subjects which may be elected by students of Industrial Science.

Students who desire to take a smaller amount of work, but enough to give them facility in writing for the press and in dealing with advertising problems, may elect suitable studies.

The department maintains a periodical reading room, a writing laboratory and a type laboratory. Excellent opportunity for practical experience is offered through work on such publications as the Iowa Agriculturist, the Iowa Engineer, the Iowa Homemaker, and Iowa State Student (three-times a week newspaper), and other publications issued at the College. The Collegiate Press, Inc., established to print these newspapers and magazines, gives opportunity to students to get contact and experience with the printing side of journalism.

Instruction in Agricultural Journalism was instituted in 1905 through the generosity of the late Mr. John Clay of Chicago. It was the first work of its kind. The John Clay agricultural journalism gifts have been accumulated in a scholarship fund, the income from which makes possible the offering of the John Clay graduate assistantship.

Many former students are in positions of prominence in the farm journalism and other technical fields.

Curriculum in Agricultural Journalism

Leading to the degree of Bachelor of Science.

Students are required to spend the summer following their Sophomore year in practical farm work on an approved farm and to spend the

*For journalism sequence for Home Economics students, see page 214.

**Engineering students who desire to elect a sequence in Technical Journalism may substitute journalism courses for required engineering courses upon the consent of the head of their department and their dean.

summer following their Junior year in practical work with some approved farm journal or other paper.

There shall be a total of 15 hours of electives taken in one major line of agriculture. Thirty hours in all must be elected in courses in agriculture or related to agriculture.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
General Chemistry Chem. 101[1]	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Livestock Problems A.H. 101	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
Crop Production F.C. 104	4	Crop Production F.C. 105	4	General Horticulture Hort. 114	3
General Botany Bot. 101	3	American Government Govt. 214	3	Mathematics Math. 205	4
Military 121	1	Military 122	1	Military 123	1
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Tech. Lect., T.Jl. 110 (Spring); Orientation Ag. 101, 102; Ag. 104, see page 117.

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Technical Writing T.Jl. 221	4	Technical Writing T.Jl. 222	4	Technical Writing T.Jl. 223	4
Organic and Quantitative Chem. 255	3	*Organic and Quantitative Chem. 256	3	Forage Crops F.C. 214	4
Gen. Poul. Husbandry A.H. 144 or Breeds of Livestock A.H. 205	3 or 4	Farm Machinery A.E. 334	4	Farm Dairying D.I. 114	4
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
Soils Soils 254	3				
Military 221	1	Military 222	1	Military 223	1
		Electives	2	Electives	1
	17 or 18		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Seminar, T.Jl. 201, 202, 203.

*Students who do not plan to take their minor work in animal husbandry or farm crops and soils may substitute, with the consent of the Department of Technical Journalism, another course for Chemistry 256.

JUNIOR YEAR

Technical Writing T.Jl. 321	3	Technical Writing T.Jl. 322	3	Technical Writing T.Jl. 323	3
Copy Editing and Typography T.Jl. 341	2	Copy Editing and Typography T.Jl. 342	2	Copy Editing and Typography T.Jl. 343	2
				Management of Technical Journals T.Jl. 451	2
General Bacteriology Bact. 304A	5	Economic History Hist. 324	3	Farm Forestry For. 100	3
Reasoning and Writing Engl. 205	3	General Psychology Psych. 204	3	American Nation Hist. 423	3
Electives	4	Electives	6	Electives	4
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, T.Jl. 301, 302, 303.

For information concerning the Reserve Officers' Training Corps, see page 244.

SENIOR YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Management of Technical Journals T.Jl. 452	2	Management of Technical Journals T.Jl. 453	2	Technical Writing T.Jl. 423	3
Mechanics of Printing and Illustrating T.Jl. 465	3	Technical Writing T.Jl. 422	3	Technical Advertising T.Jl. 446	3
Technical Writing T.Jl. 421	3	Technical Advertising T.Jl. 445	3	Electives	11
Business Psychology Psych. 484	3	Rural Sociology Ec. 386	3		
Money and Banking Ec. 304	3	Electives	6		
Electives	3				
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Seminar, T.Jl. 401, 402, 403.

Description of Courses

For description of non-collegiate courses, see page 292.

110. **Technical Lecture.** Survey of the field of agricultural and technical journalism. Spring. Lect. 1. Required.

201, 202, 203. **Seminar.** Survey of the field of agricultural and technical journalism. Required each course.

221, 222, 223. **Technical Writing.** News values, news style, news gathering and writing, history of technical journals. Prerequisite: Engl. 103. Fall, Winter, Spring, respectively. Lab. 4, 3 hr. Credit 1 to 6 each course. Students enroll for 4 labs. Quality of work determines the number of credits earned. Open to professional journalism students.

225, 225A, 225B. **Beginning Technical Journalism.** News values, news gathering and writing, with special reference to technical subject matter. Prerequisite: Engl. 103. Fall, Winter, Spring. (225) Rec. 3. Credit 3. (225A) For engineering students. Rec. 2 or 3. Credit 2 or 3. (225B) For home economics students. Rec. 3. Credit 3.

301, 302, 303. **Seminar.** Continuation of 203. Required each course.

321, 322, 323. **Technical Writing.** Gathering of material and preparation of articles for technical magazines, editorial writing. Prerequisite: 223. Fall, Winter, Spring, respectively. Rec. and confer. 3. Practice work as arranged. Credit 1 to 5 each course. Students enroll for 3 hours. Quality of work determines number of credits earned. Open to professional journalism students.

325. **Technical Advertising.** Same as 445. For other students than those professionally interested in advertising. Fall, Winter, Spring. Rec. 2. Confer. 1. Credit 2 or 3.

335. **Feature Articles for Technical Journals.** Writing of the longer feature and magazine articles dealing with agriculture, engineering, or home economics. Prerequisite: 225 Fall, Winter, Spring. Rec. 3. Credit 3.

341, 342, 343. **Practice in Copy Editing and Typography.** Copy editing, headline writing and make-up. Type, type setting and design of printed matter. Prerequisite: 223 or 225. Fall, Winter, Spring, respectively. Lab. 2, 3 hr. Credit 2 each course.

401, 402, 403. **Seminar.** Continuation of 303. Required each course.

421, 422, 423. **Technical Writing.** Practice with various types of news writing, problems and readings in journalism ethics, law and the psychology of public opinion. Prerequisite: 323. Fall, Winter, Spring, respectively. Rec. and confer. 3. Practice work as arranged. Credit 1 to 5 each course. Students enroll for 3 hours. Quality of work determines number of credits earned. Open to professional journalism students.

445, 446. **Technical Advertising.** Fundamental principles and practice of advertising. Application to industries related to agriculture, engineering, home economics and the sciences. (445) Winter. Rec. 3. Credit 3. (446) Spring. Rec. 1. Lab. 2, 3 hr. Credit 3. Both courses open to professional journalism students.

451, 452, 453. **Management of Technical Journals.** Editorial, advertising, and circulation problems. Legal and ethical phases of technical journalism. Prerequisite: 223 or 225. Spring, Fall, Winter, respectively. Rec. 2. Credit 2 each course.

465. **Mechanics of Printing and Illustrating.** Study of mechanical phases of making of a newspaper or technical journal. Prerequisite: 223 or 335. Fall. Rec. 3. Credit 3.

475. **Radio Writing.** Preparation of material for radio broadcasting. Prerequisite: 335 or 323, and P.S. 254 or equivalent. Fall, Winter, Spring. Rec. 3. Credit 3.

THEORETICAL AND APPLIED MECHANICS

HERBERT J. GILKEY, Head of Department

Associate Professor Dunagan; Assistant Professors Jensen, Murphy; Instructors Ernst, Lightburn, McDowell, Pagels

For information concerning the Division of Engineering, see page 63.

The courses in mechanics are intermediate between those in physics and mathematics and the professional and design courses of the several engineering curricula. In the work of this department the student is expected to acquire an elementary conception of the principles underlying the technique of analysis and a knowledge of those properties of materials which influence the manner and extent of their use for engineering purposes. He is expected to gain some insight into the background of purchase and design specifications. Physical properties of engineering materials are studied in the classroom and are determined in the laboratory. General laws, such as those of Newton, are given mathematical expression and are made suitable for use in the solution of specific problems in machine and structural design and in the flow and measurements of liquids Rigorous training is supplied in the simpler applications of the laws of mechanics.

Description of Courses

274 **Statics of Engineering.** Force systems, resultants, equilibrium, friction, centroids, moments of inertia. Prerequisite: Math. 212. Fall, Winter, Spring. Rec. 3. Credit 3.

324. **Mechanics of Materials.** Elements of stress analysis as applied to boilers, beams, shafts, springs, columns, etc. Includes simple stress, combined stresses, deflections, eccentric loading, impact, and fatigue. Prerequisite: 274. Fall, Winter, Spring. Rec. 5. Credit 5.

327. **Materials Laboratory.** Experimental determination of physical properties of steel, cast-iron, timber, concrete and/or other engineering materials. Studies of specifications Preparation of reports Prerequisite. credit or classification in 324. Fall, Winter, Spring. Lab. 1 or 2, 3 hr. Credit 1 or 2

334. **Properties of Materials.** Properties, uses, and manufacture of metals, timber, stone, clay products, cements, concrete, and other engineering materials. Fall, Winter, Spring. Rec. 2 or 3. Credit 2 or 3.

338. **Cement and Concrete.** Design and control of concrete mixtures. Testing of cement, aggregates, and plain concrete. Factors influencing the strength and usefulness of concrete. Prerequisite: 327, 334. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

344. **Dynamics of Engineering.** Moments of inertia of masses; kinematics; motions of particles and of rigid bodies. Kinetics; force, mass, acceleration; work and energy; impulse and momentum. Prerequisite: 274. Fall, Winter, Spring. Rec. 4. Credit 4.

378. **Hydraulics.** Mechanics of liquids. Static pressure on tanks, dams, and pipes. Flow through orifices, nozzles, pipe lines, canals, weirs, etc. Measurement of water. Elementary hydro-dynamics. Prerequisite: 344. Fall, Winter, Spring. Rec. 2. Group conferences 2, 2 hr. Credit 4.

498. **Construction Materials.** Field inspection. Sampling, testing methods; advanced studies relating to the structural use of such materials as timber, concrete, clay products, and metals. Prerequisite: 324, 334 (also 338 when the work is to be largely with concrete). Fall, Winter, Spring. Rec. 1. Lab. 2, 3 hr. Credit 3 to 6.

514. **Advanced Mechanics of Materials.** Special problems met in engineering. Limitations of flexure and torsion formulas, unsymmetrical bending, curved beams, combined stresses, thin tubes, thick hollow cylinders, flat plates. Prerequisite: 324. Rec. 3. Credit 3.

515. **Development of Mechanics.** Historical study of the development of the principles of mechanics. Rec. 3. Credit 3.

516. **Advanced Properties of Engineering Materials.** Properties in relation to use; factors that influence working stresses; basis of standard specifications. Prerequisite: 324, 334. Rec. 3. Credit 3.

524. **Advanced Technical Statics.** Principle of virtual work; moment distribution; the column analogy; applications to engineering problems. Prerequisite: 324. Rec. 3. Credit 3.

594, 595. **Applied Elasticity.** The fundamental relations of elasticity; uniform and non-uniform states of stress; Airy's function; applications to engineering problems. Prerequisite: 324. Rec. 3. Credit 3 each course.

600. **Research.** Messrs. Gilkey, Griffith, Dunagan.

606. **Higher Mechanics of Engineering.** Application of the general dynamic equations to the analyses of such structures as retaining walls, tunnels, beams, and columns; general laws of distribution; structure of matter. Prerequisite: 324. Rec. 1. Lect. 1. Lab. 1, 3 hr. Credit 3. Mr. Griffith.

614. **Analytical Study of Experimental Work in Concrete.** An interpretative survey of the background of present concrete practice. Prerequisite: 338, C.E. 437, or equivalent. Rec. 3. Credit 3. Mr. Gilkey.

664, 665. **Mathematics of Elasticity.** (Math. 664, 665.) An application of a general stress strain analysis to flexure of beams, torsion of rods, elastic energy of strain, deflection of plates, vibration phenomena, and elastic impact. Prerequisite: Math. 314, 315. Lect. 3. Credit 3. Mr. Holl.

666. **Vibration Problems.** (Math. 666.) Harmonic and non-harmonic vibrations; generalized co-ordinates and Lagrange equations of motion with applications to vibration of beams, columns, plates, and rotating disks. Prerequisite: 324, Math. 314. Lect. 3. Credit 3. Mr. Holl.

VEGETABLE CROPS

See Horticulture, page 216.

VETERINARY MEDICINE

For general statement concerning the Division of Veterinary Medicine, see page 72.

ENTRANCE REQUIREMENTS

See also Entrance Requirements by Divisions, page 41.

Applicants for admission to the Division of Veterinary Medicine must present a total of not less than 1 year (45 quarter or 30 semester credits) of work in an approved college or university. The college credits must include:

1. English ---------- 9 quarter credits (6 semester credits)
2. Chemistry ----------12 quarter credits (8 semester credits)
3. Biological Sciences ------- 9 quarter credits (6 semester credits)
4. Electives ----------15 quarter credits (10 semester credits)

It is recommended that the biological science be 6 credits in zoology, 3 credits in botany, and that the electives be selected from German, French, mathematics, and physics.

For those who wish to take their pre-veterinary work at Iowa State College, the Division of Industrial Science offers excellent facilities. Deficiences in entrance credits can be made up here not only during the college year but also during the summer sessions. See also Restricted Enrollment, below.

Curriculum for Pre-Veterinary students, see page 230.

RESTRICTED ENROLLMENT

The demand for veterinarians has resulted in larger enrollment in all of the veterinary colleges. Recently, Iowa State College has been receiving applications for admission to the curriculum in Veterinary Medicine from more students than can be effectively trained with the present staff and equipment. For this reason, it has become necessary to limit the enrollment in the first-year class in Veterinary Medicine to approximately fifty students.

In selecting the candidates for the first-year class, a personal conference with some member of the veterinary faculty or other person designated by the College will be required in each case. High school records, scholastic performance in the pre-veterinary year, experience, and evidence of good character and satisfactory personality will be given special consideration in selecting students for this curriculum. Other things being equal, residents of Iowa will be given preference.

GENERAL PLAN OF INSTRUCTION

The fundamental veterinary sciences are studied during the first two years and in all subjects the work is concentrated with an increased efficiency in methods of instruction. Much of the instruction is given as laboratory exercises and forms the foundation for the practical work which follows.

The third and fourth years are devoted to the practical clinical courses which are taught by lectures, quizzes and use of clinical cases. A feature of the curriculum is the privilege allowed the best students, of selecting work on the basis of departmental programs. This makes it possible for the good student to select a group of courses which will prepare him for any branch of the veterinary science in which he may be particularly interested. At least 15 hours of the time of the Senior year is devoted to these special programs which are arranged for the student in consultation with the head of the department concerned. While the student in veterinary medicine usually does not care to become a specialist in a narrow field, most students desire to pursue additional courses in some department which will better fit them for a career in some branch of professional service. The arrangement of the curriculum makes this possible.

Curriculum in Veterinary Medicine

Leading to the Degree of Doctor of Veterinary Medicine.
For entrance requirements, see page 36.

FIRST YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Gross Anatomy Vet.Anat. 211	6	Gross Anatomy Vet.Anat. 212	8	Gross Anatomy Vet.Anat. 213	7
Microscopic Anatomy Vet.Anat. 201	5	Microscopic Anatomy Vet. Anat. 202	4	Microscopic Anatomy Vet.Anat. 203	4
Organic Chemistry Chem. 174	5	Physiological Chemistry Chem. 175	5	Animal Husbandry A. H. 107	6
Military 221	1	Military 222	1	Military 223	1
Physical Education 201	R	Physical Education 202	R	Physical Education 203	R
	17		18		18

SECOND YEAR

Bacteriology Vet.Hyg. 224	7	General Pathology Vet.Path. 255		Special Pathology Vet.Path. 256	8
Mammalian Physiology Vet.Phys. 264	6	Nutritional Physiology Vet.Phys. 265	6	Mammalian Physiology Vet.Phys. 266	6
General Pharmacology Vet.Phys. 267	4	Pathogenic Bacteriology Vet.Hyg. 225	5	Special Pharmacology Vet.Phys. 268	5
	17		18		19

THIRD YEAR

Medicine Vet.Med. 331	6	Medicine Vet Med. 332	6	Medicine Vet.Med. 333	6
General Surgery Vet.Surg. 371	6	Special Surgery Vet Surg. 372	5	Special Surgery Vet.Surg. 373	7
Animal Parasites Vet.Path. 354	6	Obstetrics Vet.Obst. 345	5	Small Animal Medicine Vet.Med. 336	3
Clinics Vet.Surg. 381	1	Clinics Vet Surg. 382	1	Clinics Vet.Surg. 383	1
Clinics Vet.Med. 381	1	Clinics Vet.Med. 382	1	Clinics Vet.Med. 383	1
	20		18		18

FOURTH YEAR

Infectious Diseases Vet.Hyg. 421	6	Infectious Diseases Vet.Hyg. 422	6	Infectious Diseases Vet.Hyg. 423	6
Clinics Vet.Surg. 481	2	Clinics Vet.Surg. 482	2	Clinics Vet.Surg. 483	2
Clinics Vet.Med. 481	2	Clinics Vet.Med. 482	2	Clinics Vet.Med. 483	2
Business Law Ec. 365	3	Poisonous Plants Bot. 456	3	Feeds and Feeding A. H.416	3
*General Genetics Gen. 300	3	*Applied Avian Path. Vet.Path. 450	3	*Serum & Vaccine Therapy Vet.Hyg. 429	3
*Ophthalmology Vet.Surg. 490	2	*Advanced Therapeutics Vet.Phys. 465	2	*Advanced Therapeutics Vet.Phys. 466	2
†Electives (Spec. Probs.)	5	†Electives (Spec. Probs.)	5	†Electives (Spec. Probs.)	5
	18		18		18

†Students who have shown ability to work independently may take 5 hrs. of electives—Special Problems— instead of the courses marked by *

Curriculum in Industrial Science and Veterinary Medicine

When possible, students are encouraged to take the combined six-year curriculum in Industrial Science and Veterinary Medicine. By including not less than the minimum amount of required credits prescribed for entrance to the Veterinary Division, and by careful selection of courses taken within the two years spent in pre-veterinary study, it is possible to secure sufficient credit by the end of the second year of the Veterinary Curriculum to receive the Bachelor of Science degree.

Administered jointly by the Dean of the Division of Industrial Science and the Dean of the Division of Veterinary Medicine. For curriculum, see page 231.

VETERINARY ANATOMY

H. L. Foust, Head of Department

Assistant Professors Leith, Whitlock; Instructor Cocking; Assistant Calhoun

For information concerning the Division of Veterinary Medicine, see page 72.

The department of Anatomy gives instruction to students in both Veterinary Medicine and Animal Husbandry. The laboratories are well equipped. In histology each student is assigned an individual desk with a microscope, and 200 permanent mounts of tissue. The dissecting room is modern. All cadavers are preserved. Students in Animal Husbandry prepare for their work in nutrition and stock judging. Veterinary students should have a detailed knowledge of the structure of the domestic animals to properly understand Physiology, Pathology, Diagnosis, Surgery, and Medicine.

The following methods are used in teaching anatomy: didactic instruction, quiz, specimen demonstration, specimen study, lantern slide demonstration, dissection, sketching, the use of the living animal for palpating and outlining the structures. A large and well selected number of specimens and lantern slides are used in the class and laboratory demonstrations to emphasize the most important structures and their relations from a clinical standpoint. In the laboratory special attention is given to fascial compartments, joint pouchings, vaginal sheaths, bursae, and topography.

The class work is mostly quizzes, with supplemental statements and demonstrations by the instructors to fix the knowledge of the structures of the animal body gained in the laboratory by the student.

Description of Courses

201, 202, 203. **Microscopic Anatomy and Histology.** Cells, tissues and organs, histogenesis, organogenesis, and structure. (201) Fall. Lect 2. Lab 3, 3 hr. Credit 5. (202) Prerequisite: 201. (203) Prerequisite: 202. Winter, Spring, respectively. Lect. 1. Lab. 3, 3 hr. Credit 4 each course.

211, 212, 213. **Gross Anatomy.** Systematic and topographic study and dissection of horse, ox, sheep, pig, dog, fox, cat, chicken, and laboratory animals. (211) Fall. Rec. 2. Lab. 4, 3 hr. Credit 6. (212) Prerequisite: 211. Winter. Rec. 3. Lab. 5, 3 hr Credit 8. (213) Prerequisite: 212. Spring. Rec. 3. Lab. 4, 3 hr. Credit 7.

217. **Anatomy of Domestic Animals.** For Animal Husbandry students. Skeleton, muscles, and visceral organs of the horse and ox, including the common unsoundnesses of the horse. Fall, Winter. Rec. 3. Credit 3.

414, 415, 416. **Special Problems.** Problems in gross and microscopic anatomy. Prerequisite: First three years of Veterinary Curriculum. Fall, Winter, Spring, respectively. Credit 5 each course.

616. **Research.**

A. Gross Anatomy. Mr. Foust.

B. Microscopic Anatomy. Mr. Foust.

VETERINARY HYGIENE

C. H. STANGE, Head of Department

Professor Murray; Associate Professors Merchant, Biester, McNutt; Instructor Karlson; Graduate Assistant Holm

For information concerning the Division of Veterinary Medicine, see page 72.

The Department of Veterinary Hygiene includes instruction in:

1. The causative factors of the numerous diseases of animals known as contagious or infectious diseases.
2. The principles of immunity and methods of producing vaccines, serums, and other immunizing agents; indications and contra-indications for the use of various immunizing agents are studied.
3. Infectious diseases, their cause, manner of spread, diagnostic methods employed in their recognition, and means of prevention.
4. General hygiene measures which assist in promoting health such as proper ventilation of buildings, drainage, influence of soil, feeding, etc.
5. Food hygiene which includes studies of methods of inspecting the various food products of animal origin, regulations and control of inter-communicable diseases.

Description of Courses

224. **General and Pathogenic Bacteriology.** (Bact. 224.) Morphology, classification, cultivation and physiological characteristics of pathogenic bacteria; principles of infection and immunity. Fall. Rec. 4. Lab. 4, 3 hr. Credit 7.

225. **Pathogenic Bacteriology.** (Bact. 225.) Detailed study of the bacteria associated with animal diseases. Continuation of 224. Winter. Rec. 3 Lab. 3, 2 hr. Credit 5.

421, 422. **Infectious Diseases.** Diagnosis and methods of control. General hygiene and sanitation. Fall, Winter, respectively. Rec. 6. Credit 6 each course.

423. **Food Hygiene.** Designed to meet the requirements of federal, municipal and rural meat inspection; also milk and dairy inspection and hygiene. Prerequisite: 224, and Vet. Path. 256. Spring. Rec. 6. Credit 6.

424, 425, 426. **Special Problems.** For senior veterinary students by consultation with the head of department. Work is advanced beyond that taken during the first three years in general or food hygiene, bacteriology, immunity, or infectious diseases. The number of students in each section is limited. Fall, Winter, Spring, respectively. Credit 5 each course.

427. **Livestock Sanitation.** (For Agricultural students.) Prerequisite: Bact. 304. Spring. Lect. 3. Credit 3.

428. **Poultry Sanitation.** (For Poultry Husbandry students.) Spring. Lect. 2. Credit 2.

429. **Serum and Vaccine Therapy.** Study of the manufacture of immune serums, vaccines, and bacterins. Indications for use and results obtained. Prerequisite: 224, 225, or equivalent. Spring. Rec. 3. Lab. as arranged. Credit 3.

524. **Seminar.** Fall, Winter, Spring. Credit 1.

690. **Research.**

A. General and Food Hygiene. Mr. Merchant.

B. Pathogenic Bacteriology. (Bact. 690B) Mr. Murray.

VETERINARY MEDICINE

C. H. COVAULT, Head of Department

Instructor Smith

For information concerning the Division of Veterinary Medicine, see page 72.

The study of medicine summarizes and shows the application in practice of the training previously received in Anatomy, Physiology, Pathology, Bacteriology, and Therapeutics. The work is given in the form of lectures, quizzes and clinical demonstrations and extends throughout the Junior and Senior years. Diagnostic methods employed in the detection of animal diseases are carried out by each student on the various organs and systems of the different species of animals. The surrounding community furnishes an abundance of material for such work. When cases cannot be brought to the hospital, students are taken to the farms and given actual practice in the diagnosis and treatment of the cases under supervision of an experienced member of the faculty. The latter arrangement provides a large variety of cases and gives opportunity to observe both healthy and diseased animals under natural farm conditions, and the student is taught how to overcome difficulties frequently met with on the farms where facilities are restricted.

On completion of the Senior year the student has not only the theoretical knowledge, but some of the most practical methods of applying such knowledge. The transition from the student to the practitioner presents little difficulty after such training.

Description of Courses

331, 332, 333 **Medicine.** Methods employed in the diagnosis of animal diseases and a consideration of diseases not widely spread. Prerequisite: Vet. Anat. 213; Vet. Hyg. 224; Vet. Path. 256; Vet. Phys. 266, 268. Fall, Winter, Spring, respectively. Rec. 5. Lab. 1, 3 hr. Credit 6 each course.

336. **Small Animal Medicine.** Treatment and prevention of diseases of small domestic animals. Prerequisite: Vet. Anat. 213; Vet. Hyg. 224; Vet. Path. 256; Vet. Phys. 266, 268. Spring. Rec. 3. Credit 3.

381, 382, 383. **Clinics.** From nine to eleven a.m. each day of the week except Sunday. Credit 1 each course.

434, 435, 436. **Special Problems.** Special and advanced work in small animal medicine, diagnostic and therapeutic methods. Fall, Winter, and Spring. Credit 5 each course.

481, 482, 483. **Clinics.** From nine a m. to twelve m. each day of the week except Sunday. Credit 2 each course.

VETERINARY OBSTETRICS

F. E. WALSH, Head of Department

Instructor Anderson

For information concerning the Division of Veterinary Medicine, see page 72.

The significance of a thorough knowledge of the structure, function and disease of the reproductive organs is becoming increasingly apparent. The most important problem in many of our herds is the question of production, both in offspring and food products. The department of obstetrics presents not only the work in obstetrics but considers the entire reproductive life of our domestic animals and the diseases associated therewith; it also provides many opportunities for observation and treatment of such cases through the ambulatory clinic. While this clinic is not restricted to obstetrical cases, their emergency nature makes it necessary in most cases to treat them at the farm. The ambulatory clinic is therefore unusually adapted to the teaching of obstetrics and diseases of the genital organs. Numerous charts and specimens have been prepared to assist in the instrumental work. The lectures and recitations are given in the winter quarter of the Junior year, but the clinical work continues throughout the year.

Description of Courses

345. **Principles and Practice of Obstetrics.** Care of pregnant animals. Causes and treatment of sterility. Winter. Prerequisite: First two years of Veterinary Curriculum. Lect. 5. Credit 5.

444, 445, 446. **Special Problems.** Elective in senior year. Designed for those who are interested in more detailed problems in breeding disturbances as they arise in the domesticated animal. Number of students limited to 3 or 4 in a section. Fall, Winter, Spring, respectively. Credit 5 each course.

VETERINARY PATHOLOGY

E. A. BENBROOK, Head of Department

Associate Professor Runnells; Instructor Waller; Assistant Sloss; Graduate Assistant Chaddock

For information concerning the Division of Veterinary Medicine, see page 72.

The department of Veterinary Pathology occupies the northeast build-

ing of the veterinary quadrangle. A large general student laboratory facing north, east, and west is supplied with individual equipment for a section of thirty-two students. A bacteriology preparation room and a room-incubator open into the main laboratory. A class lecture room to accommodate sixty students is equipped with projection apparatus. Office and laboratory facilities are provided for the staff and for graduate students.

In the basement, four rooms are equipped for the diagnostic laboratory. Thousands of specimens are received here yearly from veterinarians and livestock owners of Iowa for the diagnosis of animal diseases. This material is also available for research and instructional purposes. The basement also contains a well-equipped preparation room for pathology and parasitology, including photomicrography, a hygiene laboratory, and an extensive pathology and parasitology specimen collection.

The work of the department consists of a systematic study of the causes of disease and the manner in which these causes bring about alterations in the anatomical structure and chemical and physiological activities of animal tissues. The application of this study makes diagnosis more accurate and forms the foundation for rational therapeutics.

Description of Courses

255. **General Pathology.** Causes and effects of diseases applied to the body as a whole. Prerequisite: Vet. Hyg. 224; Vet. Anat. 203, 213; Vet. Phys. 264. Winter Lect. and rec. 4. Lab. 3, 2 hr. Credit 7.

256. **Special Pathology.** Etiology, pathogenesis, lesions and termination of disease in organs or systems of organs; specific infectious diseases and post mortem technic. Prerequisite: 255. Spring. Lect. and rec. 5. Lab. 3, 3 hr. Credit 8.

354. **Veterinary Parasitology.** Parasites and parasitic diseases of domestic animals. Prerequisite: 255. Fall. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

450. **Applied Avian Pathology.** The problems of disease and host resistance as encountered in poultry. Course taught by staff members of Veterinary Pathology and Veterinary Hygiene. Prerequisite: 256, 354; Vet. Hyg. 224, 226. Winter. Credit 3.

454, 455, 456. **Special Problems.** Literature and methods in pathology and parasitology of value to those students who intend to enter fields of veterinary science other than the laboratory field. Prerequisite: 256, 354. Fall, Winter, Spring, respectively. Credit 3 each course.

457, 458, 459. **Special Problems.** Literature and methods used in advanced pathology and parasitology. Planned for those who intend to enter the laboratory field. Prerequisite: 256, 354. Fall, Winter, Spring, respectively. Credit 5 each course.

650. **Research.** Mr. Benbrook, Mr. Runnells.

655. **Seminar.** Meetings of the staff and graduate students to discuss pertinent literature and problems under investigation. Fall, Winter, Spring. Credit 1. Mr. Benbrook.

Autopsies and clinical laboratory examinations are conducted for the Departments of Medicine, Surgery, and Obstetrics and are supplementary to Vet. Path. 255, 256 and 354.

VETERINARY PHYSIOLOGY AND PHARMACOLOGY

H. D. BERGMAN, Head of Department

Associate Professor Hewitt; Assistant Jones

For information concerning the Division of Veterinary Medicine, see page 72.

The southeast building of the Veterinary group is devoted to work in Physiology and Pharmacology. This building was planned for the investigation and teaching of physiological and pharmacological subjects, and is admirably arranged and equipped for the pursuance of general and research work.

In the general laboratories, students are provided with individual equipment as far as possible, and thus self reliance and individual responsibility are developed. The laboratories are well equipped with modern apparatus for physiological and pharmacological teaching and research.

Before attempting a proper conception of disease it is necessary to have an understanding of the normal functions of the body structures. The purpose of the work in Physiology is to make a detailed study of the normal functions and activities of the cells, tissues, organs, and systems constituting the animal body. The work is conducted by lectures, recitations, demonstrations, and laboratory work in which the chemical and physical processes of the animal body are considered in logical order. The lecture work is supplemented by the use of dissected specimens, demonstrations, and drawings. The laboratory work is devoted to the study of the respiratory, circulatory, muscular, and nervous systems; also digestion and absorption, and the circulating fluids of the body.

The subjects of Pharmacology are presented as lectures, assignments, laboratory and demonstration work.

Description of Courses

264. **Mammalian Physiology.** Blood, lymph; organs of circulation; mechanism of respiration, respiratory processes and exchanges. Prerequisite: Vet. Anat. 203. Fall. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

265. **Nutritional Physiology.** Digestion, absorption and general metabolism; the organs of excretion; animal heat; general principles of nutrition; and animal feeding. Prerequisite: 264, Chem. 175. Winter. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

266. **Mammalian Physiology.** Endocrine organs and internal secretions; muscular and nervous systems; special senses; reproduction and lactation. Prerequisite: 264, 265. Spring. Lect. and rec. 4. Lab. 2, 3 hr. Credit 6.

267. **Pharmacology.** Pharmaceutical processes and principles; metrology, prescription writing; classification and general properties of drugs; therapeutic methods. Prerequisite: Credit or classification in 264. Fall. Lect. and rec. 3. Lab. 1, 3 hr. Credit 4.

268. **Pharmacology and Therapeutics.** Detailed study of drugs important in veterinary medical practice, including physiological actions, therapeutic indications and posology. Prerequisite: 264, 265, 266, 267. Spring. Lect. and rec. 5. Credit 5.

364. **Comparative Physiology.** For Agricultural students. Physiology of the domestic animals, including the blood, lymph, circulatory and respiratory systems, organs of digestion and absorption as related to animal production. Prerequisite: Vet. Anat. 217. Fall. Lect. and rec. 3. Credit 3.

365. **Comparative Physiology.** Elective for Agricultural students. Continuation of 364 including general metabolism, ductless glands and internal secretions, kidneys and skin, animal heat, reproduction, and milk secretion. Spring. Lect. 3. Credit 3.

465, 466. **Advanced Therapeutics.** Clinical therapeutics covering the more recent developments in therapeutic practice and techniques. Prerequisite: Senior classification in veterinary medicine. Winter, Spring, respectively. Lect. 2. Credit 2 each course.

467, 468, 469. **Special Problems.** Selected problems in physiology to be pursued by the individual student and involving review of literature, study and development of experimental methods, experimentation, tabulating and recording of

findings and applications. Prerequisite: Senior classification in veterinary medicine. Fall, Winter, Spring, respectively. Conference and lab. as arranged. Credit 5 each course.

661, 662, 663. **Comparative Mammalian Physiology.** A series of courses especially adapted for graduate students as minor work for the M.S. and Ph. D. degrees in the fields of animal, dairy, or poultry husbandry; in the biological sciences, chemistry, and home economics.

The courses are conducted by lecture, laboratory work, and mammalian demonstrations covering the physiology of the body fluids and the organs of circulation; respiration and respiratory exchange; the alimentary tract and related organs, gastro-intestinal motility, digestion, absorption, and general nutrition; heat production and regulation; excretory organs and body excretions; the endocrine system; muscular and nervous system; reproduction and milk secretion. Fall, Winter, Spring, respectively. Credit 3 or 5 or more each course. Mr. Bergman, Mr. Hewitt.

665. **Research.** Mr. Bergman, Mr. Hewitt.

VETERINARY SURGERY

G. R. Fowler, Head of Department

Instructor Johnson

For information concerning the Division of Veterinary Medicine, see page 72.

The Department of Surgery is especially well equipped for teaching the surgical diseases and surgery of the domestic animals. The equipment includes preserved museum specimens, charts, photographs, lantern slides, and modern surgical instruments, both for classroom and laboratory instruction.

The large variety of clinical material available throughout the year makes it possible to supplement the classroom discussion with daily laboratory demonstrations. In the surgical clinic, patients are suitably anaesthetized either by local or general anaesthesia for practically all operations, thus emphasizing the importance of humane methods of treatment and giving students much practical experience in the use of these agents.

Each patient upon entering the hospital is assigned to a senior student. The student examines the case and makes a report of his findings and conclusions to the professor who also examines the animal and discusses the case with the students. The senior student assists the professor in charge and is responsible for keeping an accurate record of the treatment, daily progress of the case, and the amount and cost of materials used. Each senior student has one or more junior student assistants. The junior students assist especially in the sterilization and preparation of instruments, surgical dressings and the field of operation. They also assist the senior students in the general handling and care of the animal.

A spacious hospital with modern equipment is maintained for this work. There is ample provision for housing horses, cattle, sheep, swine and small animal patients. All the classroom work in surgery is conducted in the amphitheatre in the hospital building where animals affected with diseases under discussion, as well as instruments, and apparatus to be used in diagnosis, treatment or restraint can be brought

before the class. Clinic cases are constantly used to correlate the theoretical and the practical.

A special laboratory is conducted in which students are required to perform practically every operation employed upon both large and small animals including poultry. By this means the student acquires a practical surgical training.

Description of Courses

371. **General Surgery.** Fundamental principles. Prerequisite: First two years of the Veterinary Curriculum. Fall. Rec. 6. Credit 6.

372, 373. **Special Surgery.** Surgical diseases of the horse, ox, sheep, swine, dog, cat, and fowl. Prerequisite: 371. (372) Winter. Rec. 4. Lab. 1, 3 hr. Credit 5. (373) Spring. Rec. 6. Lab. 1, 3 hr. Credit 7.

381, 382, 383. **Surgical Clinics.** Practice in the general principles of surgery and observation of surgical diseases, their treatment and progress. Prerequisite: First two years of Veterinary Curriculum. Fall, Winter, Spring, respectively. Lab. 6, 2 hr. Credit 1 each course.

474, 475, 476. **Special Problems.** For senior students in veterinary medicine who desire special training in some branch of veterinary surgery. Assigned reading, special laboratory work, and group discussions. Subject matter will be arranged on conultation with head of department. Most of these problems will require supporting work taken in other departments. Prerequisite: First three years of Veterinary Curriculum. Credit 5 each course.

481, 482, 483. **Surgical Clinics.** Continuation of 383. Practical application of special surgical technique. Prerequisite: 383. Fall, Winter, Spring, respectively. Lab. 6, 3 hr. Credit 2 each course.

490. **Ophthalmology.** Methods of examination and diseases of the eye of domestic animals. Prerequisite: 373. Fall. Lect. 2. Credit 2.

677. **Research.** Mr. Fowler.

VETERINARY CLINICS

C. H. STANGE, Chairman

Professors Covault, Walsh, Fowler; Instructors Anderson, Smith, Johnson

Veterinary Clinics include both surgical and medical clinics for large and small animals. The hospital building is well lighted and accommodates 36 horses, 48 small animals, 8 sheep and swine at one time. A cattle wing of a new clinic building has been completed with stall capacity for 35 animals as well as clinic rooms and stocks. Two clinic rooms and two operating rooms are contained in these buildings and are well equipped with operating tables, stocks, mats and other modern equipment. A dispensary and instrument room conveniently located is in charge of a graduate pharmacist during clinic hours.

All operating rooms are equipped with steam sterilizers, operating instruments and other modern equipment. The floors and walls are of such construction as to enable the best possible sanitary conditions to be maintained.

For those cases which cannot be brought to the hospital, two automobiles are maintained so that students may be taken to the farms and help with the treatment of the various diseases under actual farm con-

ditions. From ten to twelve thousand cases are visited in this way each year. Two or three thousand cases are brought to the hospital annually.

The rich livestock producing area about the college provides an abundance of clinical material of a variety usually found in the veterinary practitioner's work.

VOCATIONAL EDUCATION

W. H. LANCELOT, Director of Teacher Training, Agricultural Annex, Room 108.
Professors F. E. Brown, Evans, Fox, Hunter, Cora B. Miller, Tilden, Vance, Veenker; Associate Professors Dietz, J. E. Foster, Friant, Fritz, Gaskill, Hamlin, Lauer, Morgan, Otopalik, E. D. Ross, Sexauer, Sharp, Starrak, Turner; Assistant Professors Byram, Chadderdon, Daniells, Myrtle H. Foster, Elizabeth Fuller, Hendrickson, Livingston, Lyle, H. J. Schmidt, Truskowski; Instructors Hausrath, McKibben, Moorehouse

For information concerning the Division of Agriculture, see page 58.

The department of Vocational Education administers two curricula especially designed for the training of teachers; namely, the curriculum in Agricultural Education and the curriculum in Agriculture and Science. The courses for the special training of general and vocational teachers of Home Economics are administered in the Division of Home Economics, but the general teacher training work is provided by this department. In like manner the special courses needed by those preparing to teach the Industrial Arts are organized in the Division of Engineering, the general teacher training work being provided by this department.

Graduation from a vocational educational curriculum, or the completion of 22½ credits of approved work in psychology (9 credits) and vocational education (13½ credits), including directed observation and practice teaching, taken in connection with any four-year college curriculum will entitle the student to a standard secondary certificate in Iowa without examination. For Teachers' Certificate, see page ——.

The work in education at Iowa State College was organized in the Division of Agriculture after the passage of the Nelson Amendment to the Morrill Act, which provided funds for the training of secondary teachers of agriculture and home economics. More recently additional legislation has provided for the training of secondary teachers and supervisors in the three vocational fields, agriculture, home economics, and industrial arts.

Curriculum in Agricultural Education

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 36.

Six months of practical work in agriculture is required before graduation. See page 117.

FRESHMAN YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Livestock Problems A.H. 101[1]	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
Crop Production F.C. 104	4	Crop Production F.C. 105	4	General Horticulture Hort. 114	3
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
General Biology Zool. 104	3	General Biology Zool. 105	3	Farm Dairying D.I. 114	4
*Drawing and Projection Engr. Dr. 181	2	Gen. Poultry Husbandry A.H. 144	3	Mathematics Math. 205	4
Military 121	1	Military 122	1	Military 123	1
	15		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Fresh. Probs., Voc.Ed. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 108.

SOPHOMORE YEAR

General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen Agr. Economics Ec. 233	3
Breeds of Livestock A.H. 205	4	*Farm Mechanics A.E. 254	2	*Carpentry A.E. 155	2
General Botany Bot. 101	3	Physics Phys. 204	3	Forage Crops F.C. 214	4
Military 221	1	Technical Journalism T.Jl. 225	3	General Psychology Psych. 204	3
		Military 222	1	Military 223	1
	15		16		17

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Voc.Ed. 201, 202, 203.

*The shop subjects may be replaced by a sequence of subjects, chosen with the approval of the head of the department, designed to provide a substitute teaching line for those who do not wish to qualify to teach Farm Mechanics.

JUNIOR YEAR

Principles of Education Voc.Ed. 304	3	Methods of Teaching Voc.Ed. 305	4	Princ. Sec. Education Voc.Ed. 306	3
Psychology of Learning Psych. 334	3	Psych. of Motivation Psych. 335	3	Farm Mgt. and Acctg. Ec. 336	3
Extempore Speaking P.S. 311	3	Extempore Speaking P.S. 312	2	American Government Govt. 315	3
Soils Soils 254	3	Fertility and Fertilizers Soils 354	5	Animal Feeding A.H. 414	5
Organic and Quantitative Chem. 255	3	†Rural Landscape Design L.A. 208	3	†Applied Hygiene Hyg. 404	3
*Concrete and Masonry A.E. 374	2				
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Voc.Ed. 301, 302, 303.

†May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 244.

*The shop subjects may be replaced by a sequence of subjects, chosen with the approval of the head of the department, designed to provide a substitute teaching line for those who do not wish to qualify to teach Farm Mechanics.

SENIOR YEAR

Fall Quarter	Credits[2]	Winter Quarter	Credits	Spring Quarter	Credits
Teaching Agriculture Voc.Ed. 501	3	Teaching Agriculture Voc.Ed. 502	3	Teaching Agriculture Voc.Ed. 503	5
Agricultural Policy Ec. 547	3	Co-operation in Agr. Ec. 335	3	Adv. Farm Org. & Mgt. Ec. 530	3
Farm Mach. and Motors A.E. 334	4	Farm Bldgs. and Equip. A.E. 489	3	Municipal, Rural San. Bact. 587	3
Rural Sociology Ec. 386	3	General Genetics Gen. 300	3	*Teach. Manual Training I.A. 515	3
Electives	4	Electives	5	Electives	3
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Voc.Ed. 401, 402, 403.

In all cases it is desirable that the student confer with the head of the department before making his choice of electives.

Note: Any student entering with advanced credits will be expected to earn at least six quarter credits in education before graduation.

Recommended electives: A.E. 345, 356; A.H. 125, 337, 425, 427; Bot. 207, 354; Ec. 334, 585, 384, 385, 484, 586, 587; F.C. 204, 414; For. 100; Hist. 211, 212, 218, 324; Hort. 164A; Zool. 374.

*The shop subjects may be replaced by a sequence of subjects, chosen with the approval of the head of the department, designed to provide a substitute teaching line for those who do not wish to qualify to teach Farm Mechanics.

Curriculum in Agriculture and Science

Leading to the degree of Bachelor of Science.

For entrance requirements, see page 36.

This curriculum provides training suited to the needs of men desiring to work in rural consolidated schools, or in other schools attended by relatively large numbers of rural pupils. It includes a major, amounting to 45 credits in agriculture, a required sequence of 30 credits in rural social science, and a minor of approximately 24 credits, selected by the students from a list of 14 such sequences offered by various departments of the College. As a result, students completing this curriculum will be able to teach at least two other subjects in addition to agriculture. It leads to the standard secondary certificate.†

FRESHMAN YEAR

Livestock Problems A.H. 101[1]	2	Livestock Problems A.H. 102	2	Livestock Problems A.H. 103	2
Crop Production F.C. 104	4	Mathematics Math. 205	4	Crop Production F.C. 105	4
Composition Engl. 101	3	Composition Engl. 102	3	Composition Engl. 103	3
General Biology Zool. 104	3	General Biology Zool. 105	3	‡Physics Phys. 204	3
General Horticulture Hort. 114	3	American Government Govt. 214	3	International Relations Hist. 203	3
Military 121	1	Military 122	1	Military 123	1
	16		16		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 101, 102, 103; Library 106A (Fall); Voc.Ed. 110 (Spring); Orientation, Ag. 101, 102; Ag. 104, see page 117.

†At the beginning of the Sophomore year the student will choose a minor of 24 credits to be completed during the Sophomore, Junior, and Senior years. In certain instances courses which would otherwise be included in the minor are listed among the required courses above. In such cases, the minor is correspondingly reduced. The essential character of these elective minors is shown on page 276.

‡May be omitted by students who expect to elect a minor in Physics.

[1]The number refers to the description of the course.

[2]For definition of a credit, see page 103.

SOPHOMORE YEAR

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Gen. Agr. Economics Ec. 231	3	Gen. Agr. Economics Ec. 232	3	Gen. Agr. Economics Ec. 233	3
General Chemistry Chem. 101	4	General Chemistry Chem. 102	4	Qualitative Analysis Chem. 103	4
General Psychology Psych. 204	3	Psychology of Learning Psych. 334	3	Psych. of Motivation Psych. 335	3
Technical Journalism T.Jl. 225	3	Extempore Speaking P.S. 311	3	Extempore Speaking P.S. 312	2
Military 221	1	Military 222	1	Military 223	1
Electives	3	Electives	3	Electives	3
	17		17		16

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 201, 202, 203; Voc.Ed. 201, 202, 203.

JUNIOR YEAR

Soils Soils 254	3	General Bacteriology Bact. 304A	5	Fertility and Fertilizers Soils 354	5
Organic and Quantitative *Chem. 255	3	Co-operation in Agr. Ec. 335	3	Farm Mgt. & Accounting Ec. 336	3
Principles of Education Voc.Ed. 304	3	Methods of Teaching Voc.Ed. 305	4	Teaching General Agr. Voc.Ed. 521	3
Land Economics Ec. 334	3				
Electives	5	Electives	5	Electives	6
	17		17		17

*In case a minor in Chemistry is elected, Chem. 255 will not be required.

In addition to the courses listed above, each student will be required to include in his schedule: Voc.Ed. 301, 302, 303.

SENIOR YEAR

Teaching Agriculture Voc.Ed. 522	3	Princ. of Secondary Educ. Voc.Ed. 306	3	Animal Feeding A.H. 414	
Teaching Agriculture Voc.Ed. 523	3	Agricultural Finance Ec. 535	3		
Agricultural Policy Ec. 547	3	Rural Landscape Design L.A. 208	3		
Rural Sociology Ec. 386	3				
Electives	5	Electives	8	Electives	12
	17		17		17

In addition to the courses listed above, each student will be required to include in his schedule: Voc.Ed. 401, 402, 403.

LIST OF MINORS OFFERED

In Bacteriology:	Bact. 304A, 5 cr.; 350, 4 cr.; 534, 3 cr.; 536, 4 or 5 cr.; 537, 3 cr.; 564, 5 cr.
In Biological Science:	Bot. 101, 3 cr.; 102, 3 cr.; Gen. 300, 3 cr.; Bact. 537, 3 cr.; Zool. 374, 4 cr.
In Botany:	Bot. 101, 3 cr.; 102, 3 cr.; 103, 3 cr.; 206, 4 cr.; 207, 4 cr.; 424, 3 or 4 cr.
In Chemistry:	Chem. 211, 4 cr.; 212, 4 cr.; 213, 4 cr.; 331, 5 cr.; 332, 5 cr.; 333, 5 cr.
In English:	Engl. 254 or 255, 3 cr.; 205, 3 cr.; 304, 3 cr.; 354 or 364, 3 cr.; 455, 3 cr.; 456, 3 cr.; 464, 3 cr.; 466, 3 cr.
In Genetics:	Math. 101, 5 cr.; 441, 3 cr.; Bot. 404 or Zool. 534, 3 cr.; Gen. 300, 3 cr.; 305, 1 cr.; 530, 3 cr.; 535, 3 cr.; 540, 1 to 3 cr.; Bact. 304D, 3 cr.; Zool. 203, 3 cr.
In Geology:	Geol. 324, 4 cr.; 375, 4 cr.; 202, 4 cr.; 434, 4 cr.; 455, 4 cr.; or 311, 3 cr.; 312, 3 cr.; 313, 3 cr.
In Economic History:	Hist. 211, 3 cr.; 212, 3 cr.; 213, 3 cr.; 421, 3 cr.; 422, 3 cr.; 423, 3 cr.; 534, 3 cr.; 564, 3 cr.
In Journalism:	T.Jl. 221, 4 cr.; 222, 4 cr.; 223, 4 cr.; 335, 3 cr.; 465, 3 cr.; 341, 2 cr.; 342, 2 cr.; 343, 2 cr.; Elective in T.Jl. ,3 cr.

In Manual Arts:	A.E. 155, 2 cr.; 254, 2 cr.; 356, 3 cr.; 334, 4 cr.; 345, 3 cr.; 374, 2 cr.; I.A. 106, 3 cr.; 515, 3 cr.; Engr. 131, 2 cr.
In Mathematics:	Math. 101, 5 cr.; 102A, 5 cr.; 103, 5 cr.; 211, 4 cr.; 212, 4 cr.
In Physics:	Phys. 204, 3 cr.; 211, 4 cr.; 212, 4 cr.; 213, 4 cr.; 404, 2 cr.; 405, 1 cr.; 498, 3 cr.; 524, 3 cr.
In Public Speaking:	P.S. 104, 2 cr.; 254, 3 cr.; Electives in P.S., 12 cr.
In Zoology:	Zool. 203, 3 cr.; 255, 5 cr.; 274, 4 cr.; 374, 4 cr.; 534, 3 cr.

Description of Courses

The work of the department is in the following fields:

Agricultural Education—110, 201, 202, 203, 301, 302, 303, 401, 402, 403, 501, 502, 503, 521, 522, 523, 544, 545, 604, 626, 644, 645.

Vocational Education—304, 305, 306, 554, 561, 562, 563, 584, 624, 625, 664, 665, 684.

Home Economics Education— 406, 407, 504, 506, 507, 508, 509, 514, 605, 606, 607, 610, 614.

Industrial Arts—317, 318, 408, 510, 515, 516, 600, 608, 609, 615, 616, 617, 618, 650.

Industrial Science courses—Bot. 494, Chem. 495, Engl. 394, Hist. 496, Math. 497, Phys. 498, Zool. 499.

Physical Education—327, 328, 411, 412, 413, 491, 492, 493.

Psychology—204, 206, 309, 334, 335, 410, 434, 634, 635, 636.

110. **Freshman Problems.** How to study, personal development, improvement of thinking, reading habits. Required of freshmen majoring in department. Spring. Rec. 1. Required.

201, 202, 203. **Sophomore Problems.** Extra-curricula activities, presiding over group meetings, training for leadership. Required of sophomores majoring in department. Fall, Winter, Spring, respectively. Rec. 1. Required each course.

204. **General Psychology.** (Psych. 204.) Study of normal human behavior. Fundamental to all other courses in Psychology. Fall, Winter, Spring. Rec. 3. Credit 3.

206. **Laboratory in General Psychology.** (Psych. 206.) A laboratory course paralleling or following 204. Rec. 1. Lab. 1, 2 hr. Credit 2. Fall, Winter, Spring.

301, 302, 303. **Junior Forum in Agricultural Education.** Required of juniors majoring in department. Fall, Winter, Spring, respectively. Rec. 1. Required each course.

304. **Principles of Education.** Objectives and organization of modern secondary schools as they affect vocational and science teachers. Prerequisite. a quality point average of 2.1. Fall, Winter, Spring. Rec. 3. Credit 3.

305. **Methods of Teaching Vocational Subjects.** Special emphasis upon principles of motivated problem teaching. Prerequisite: 304. Fall, Winter, Spring. Rec. 4. Credit 4.

306. **Principles of Secondary Education.** With special reference to the relationships sustained by vocational and science teachers in connection with the organization and management of the senior high school. Prerequisite: 304. Fall, Winter, Spring. Rec. 3. Credit 3.

309. **Mental Principles.** (Psych. 309.) Applications of psychological principles to student life. Mental health, mental efficiency, methods of study. Of importance to those directing students. Prerequisite: 204. Rec. 3. Credit 3.

317. **Social Significance of Industrial Education.** (I. A. 317.) The social influences bearing on industrial education and the reaction of this form of education on society itself. Prerequisite: Senior college classification. Fall. Rec. 3. Credit 3.

318. **Trade Analysis.** (I. A. 318.) Basic types of analyses. Preparation of instruction sheets for teaching trade subjects. Prerequisite: Senior college classification. Winter. Rec. 3. Credit 3.

327. **Theory and Practice of Coaching.** (Phys. Ed. 327.) Survey of coaching field. Coaching technique and officiating. Application of rules, plays, and coaching principles. Alternate years. Offered Winter, 1937. Lect. 2. Lab. 1, 3 hr. Credit 3.

328. **Special Problems in Teaching Physical Education.** (Phys. Ed. 328 for Women.) Alternate years. Offered Spring, 1938. Lect. 2. Lab. 1, 3 hr. Credit 3.

334. **Educational Psychology.** (Psych. 334.) The various concepts of learning and improvement. Psychology of high school subjects. Prerequisite: 204. Fall, Winter, Spring. Rec. 3. Credit 3.

335. **Educational Psychology.** (Psych. 335.) The treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334. Winter. Rec. 3. Credit 3.

394. **The Teaching of English.** (Engl. 394.) For students preparing to teach English in addition to other subjects. The teaching of literature and composition. Prerequisite: a quality point average of 2.5 in Engl. 255, 364 or 464, and 205 or 304. Spring. Rec. 3. Credit 3.

401, 402, 403. **Senior Forum in Rural Education.** Required of seniors majoring in the department. Fall, Winter, Spring, respectively. Rec. 1. Required each course.

406. **Methods of Teaching Home Economics.** (H. Ec. Ed. 406.) Objectives for home economics courses in high school. Selection of problems for realizing objectives. Methods of presenting problems. Uses of objective material. Directed observation and participation in teaching. Prerequisite: 305, and completion of two quarters of Junior year. Rec. 3. Lab. as arranged. Credit 4.

407. **Supervised Teaching in Home Economics.** (H. Ec. Ed. 407.) Supervised teaching in public schools having co-operative agreement. Prerequisite: Credit or classification in 406. Fall, Winter, Spring. Lab. as arranged. Credit 4.

408. **Foundations of Industrial Education.** (I. A. 408.) Development of the movement; the Smith-Hughes Act, state plans and laws relating to industrial education. Spring. Rec. 3. Credit 3.

410. **Psychology of Skill.** (Psych. 410.) The development of skill and skill techniques. Habit making and breaking; transfer of training and its principles; mechanical aptitudes and intelligence. Principles of motivation effective in the shop; development of muscular co-ordination. Laboratory methods and demonstrations. Prerequisite: 204. Alternate years. Offered Winter, 1937. Rec. 3. Credit 3.

411, 412, 413. **Supervised Teaching in Physical Education.** (Phys. Ed. 411, 412, 413.) Practice with school and college groups. Fall, Winter, Spring. Lab. 6. Credit 1 or 2 each quarter.

417. **Directed Observation and Practice Teaching in the Sciences.** (I. S. 417) Observation, evaluation of instruction, lesson planning and classroom teaching in the sciences. Prerequisite: 305, or equivalent, special methods, and 20 credits in subject matter field. To be arranged in advance. Fall, Winter, Spring. Credit 5.

434. **Tests and Educational Measurement.** (Psych. 434.) Treatment of tests and their application in educational, vocational, and industrial guidance and selection. Important for teachers, employers, and vocational counselors. Prerequisite: 204. Fall, Spring. Rec. 3. Credit 3.

491. **Principles of Physical Education.** (Phys. Ed. 491 for Men.) Interpretation of objectives of physical education and health education. Analysis of activities in terms of developmental objectives. Prerequisite: Zool. 255, Voc. Ed. 304. Fall. Rec. 3. Credit 3

492. **Methods of Teaching Physical Education.** (Phys. Ed. 492 for Men.) Application of general education methods to physical education. Special methods of teaching activities not covered in 314, 315, 316, 317. Prerequisite: Psych. 334, 335. Winter. Rec. 3. Credit 3.

493. **Organization and Administration.** (Phys. Ed. 493.) Organization and administration of physical education and athletics. Program for required and elective courses, intramural and interschool athletics. Athletic management. Prerequisite: Phys. Ed. 201, 202, 203. Spring. Lect. 3. Credit 3.

494. **Methods of Teaching Botany.** (Bot. 494.) Prerequisite: 15 credits of botany. Spring. Rec. 3. Credit 3.

495. **Teaching Chemistry.** (Chem. 495.) Methods of presentation and study of subject matter supported by class and laboratory demonstration. Prerequisite: 15 credits of chemistry including Chem. 211 or 331, or equivalent. Lect. and rec. 2. Lab. 1, 3 hr. Credit 3.

496. **Methods of Teaching the Social Studies.** (Hist. 496.) Methods of teaching history, government, economics, and sociology in the high school and the junior college. Prerequisite: Fifteen credits of history including Hist. 211, 212, 213, or equivalent. Alternate years. Offered Spring, 1937. Rec. 3. Credit 3.

497. **Teaching Vocational Mathematics in Junior and Senior High Schools.** (Math. 497.) Several practical aspects of teaching mathematics such as organization of subject matter, methods of presenting typical topics, and tests for measuring results. Prerequisite: 15 credits of college mathematics. Spring. Lecture and observation 3. Credit 3.

498. **Teaching of Physics.** (Phys. 498.) A technique course. To acquaint prospective teachers with the recent educational advances in methods as they apply to the teaching of physics. A study of the content of the high school physics, and practice in presentation of various topics. Prerequisite: 15 credits of physics including Phys. 211, 212, 213, or equivalent. Winter. Lect. and rec. 3. Credit 3.

499. **Methods in Teaching Animal Biology and Physiology.** (Zool. 499.) Study and observation of methods and practical devices in teaching. Prerequisite: 15 credits of zoology including one year of introductory biology. Spring. Rec. 3. Credit 3.

501, 502, 503. **Directed Observation and Practice Teaching in Vocational Agriculture.** Observation, evaluation of the results of instruction, planning of community programs, classroom teaching, etc. Prerequisite: 305 and the completion of courses equivalent to those in the first 3 years of the curriculum in Agricultural Education. (501) Fall. Rec. and lab. 2, 3 hr. Credit 3. (502) Winter. Rec. and lab. 2, 3 hr. Credit 3. (503) Fall, Winter, Spring. Lab. as arranged. Credit 5.

504. **Special Topics in Home Economics Education.** (H. Ec. Ed. 504.) Prerequisite 406.

506. **Teaching Human Relationships in the Public Schools.** (H. Ec. Ed. 506.) Objectives, selection of material, and problem organization of courses in human relationships, including family and community relationships, child care, and personality development. Prerequisite: 407, C. D. 435, H. Mgt. 474, or equivalent. Summer, second term. Rec. 6. Credit 3.

507. **Methods of Teaching Related Art.** (H. Ec. Ed. 507.) Objectives for related art courses in vocational schools. Selection of problems in teaching and methods of presenting problems. Use of references and illustrative materials. Prerequisite: Voc. Ed. 305, and A. A. 264. Winter, Spring. Rec. 2. Credit 2.

508. **Methods of Teaching Adult Homemaking Classes.** (H. Ec. 508.) Place of Home Economics in the adult program. Organization of adult classes. Planning units of work—observation of adult classes. Prerequisite: Credit or classification in 406. Winter, Spring. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

509. **The Home Economics Movement.** (H. Ec. Ed. 509.) The development of home economics in relation to the education of women. Reports of present day fields in which home economics is active. Fall, Spring. Rec. 2. Credit 2.

510. **Technique of Teaching Trades.** (I. A. 510.) The teaching processes, methods of presentation and testing, lesson planning, organization for instruction. Spring. Rec. 3. Credit 3.

514. **Methods for Vocational Teachers.** (H. Ec. Ed. 514.) Organization of vocational program. Home projects. Teaching of related science. Prerequisite: 305. Winter, Spring. Rec. 3. Credit 3.

515, 516. **Teaching Industrial Arts.** (I. A. 515, 516.) Curricula, observation, supervised teaching, demonstrations, organization, and administration. Prerequisite: 305, or equivalent. Fall, Winter, respectively. Rec. and lab. 3. Credit 3. each course.

518. **Problems in Industrial Education.** (I. A. 518.) Administration and supervision of industrial education programs in public schools. Spring. Rec. 3. Credit 3. Mr. Baird.

521 522, 523. **Teaching General Agriculture.** Curricula in general agriculture, methods, observation, and supervised teaching. Prerequisite: 305. (521) Fall, Spring. (522) Winter. Rec. 3. Credit 3 each course. (523) Fall, Winter, Spring. Lab. as arranged. Should be arranged in advance.

524. **Industrial Conference Methods.** (I. A. 524.) Use of the conference method in instruction. Study and practice of conference procedure, devices, and technique. Prerequisite: industrial or industrial teaching experience. Summer. Rec. 6. Credit 3. Mr. Baird.

525. **Problems in Part-Time Education.** (I. A. 525.) Demands upon supervisors, principals, teachers, and co-ordinators working in the field of part-time schools for employed minors. Winter. Rec. 3. Credit 3. Mr. Hunter.

534. **Administration of the Guidance Program.** Principles and practices in aiding students to make educational and vocational adjustments; occupational studies; testing and records; counseling; group guidance and follow-up. Rec. 3. Credit 3. Summer and Saturday classes. Mr. Byram.

535. **Administration of the Testing Program.** Methods of measuring educational outcomes; types of tests and their construction; use and intepretation of tests in teaching. Rec. 3. Credit 3. Summer and Saturday classes. Mr. Byram.

536. **Adult Education.** Survey of current trends and present activities in field of adult education, special problems and practices in conducting adult education programs. Rec. 3. Credit 3. Summer and Saturday classes. Mr. Sexauer.

544. **Administration of Village and Consolidated Schools.** Fiscal administration in local school systems, equipment and supplies, building and grounds, transportation, curriculum, school and community activities, information service. Summer, second term. Rec. 6. Credit 3.

545. **Supervision of Village and Consolidated Schools.** Improving teachers in service through classroom visitations, personal conferences, and teachers' meetings. Modern methods of teaching certain school subjects. Summer, first term. Rec. 6. Credit 3.

554. **Administration of Vocational Education.** Development and present best practice, prevocational education, vocational guidance, and vocational training. Summer. Rec. 6. Credit 3.

561, 562, 563. **Methods of Teaching College Subjects.** With special reference to the use of motivated problems in presenting technical subjects. Fall, Winter, Spring, respectively. Rec. 1 to 3. Credit 1 to 3, each course

584. **History of Industrial and Vocational Education.** Chief emphasis upon the modern movement. Winter. Rec. 3. Credit 3.

600. **Problems in Industrial Arts Education.** (I. A. 600.) Summary of recent findings of research; methods of attack on new problems. Fall. Rec. 3. Credit 3

604. **Administration of Agricultural Education.** Objectives, curriculum, relationships with public schools and with state and federal agencies; and other similar problems. Summer, first term. Rec. 6. Credit 3. Mr. Hamlin, Mr. Sexauer.

605. **Home Economics Curricula.** (H. Ec. Ed. 605.) Survey of public school home economics curricula and recent curriculum studies. Technique of curriculum building. Objectives and problems for specific courses. Prerequisite: credit or classification in 562. Spring. Rec. 3. Credit 3. Miss Turner.

606. **Technique of Supervision.** (H. Ec. Ed. 606.) Objectives, techniques, and organization of teacher training supervision and state supervision. Prerequisite: 407 or equivalent. Spring. Credit 3 to 6. Miss Friant.

607. **Survey Course in Methods for Teaching Home Economics in the Public Schools.** (H. Ec. Ed. 607.) Investigation and reports of present day trends in methods of teaching home economics Prerequisite: teaching experience. Summer, first term. Rec. 5. Credit 2. Miss Miller.

608. **Advanced Teaching Problems in Industrial Arts.** (I A 608.) Supervision, teaching, and promotion of industrial arts, including a study of successful systems now in use Prerequisite undergraduate major or minor in education or psychology. Summer. Rec. 6. Credit 3. Mr. Hunter.

609. **Historical Research in Industrial Education.** (I. A. 609.) Original sources for historical research, individual problems, appreciation of the historical foundation of industrial education, significant movements in Europe and America. Alternate years. Offered Summer, 1937. Rec. 6. Credit 3. Mr. Livingston.

610 **Seminar in Home Economics Education.** (H. Ec Ed 610.) Credit and hours as arranged. Miss Friant.

614. **Research in Home Economics Education.** (H. Ec. Ed 614.) Misses Miller, Friant, Turner, Chadderdon.

617. **Curriculum Building in Industrial Education.** (I. A 617.) Organization of curricula for shop and related technical instruction in trade technical schools or classes Prerequisite: 318, or equivalent. Winter. Rec 3. Credit 3. Mr. Hunter.

624. **Research Methods in Vocational Education.** Adaptation of research technique to problems in vocational education. Fall. Rec. 3. Credit 3. Mr. Hamlin, Mr. Starrak.

625. **Research in Vocational Education.** Prerequisite 624 Messrs. Lancelot, Hamlin, Starrak, Morgan.

626 **Research in the Administration or Supervision of Rural Education.** Prerequisite. 624. Messrs. Hamlin, Morgan.

634 **Educational Psychology.** (Psych. 634.) The various concepts of learning and improvement Psychology of high school subjects Prerequisite. 204. Fall, Winter, Spring Rec 3. Credit 3. Graduates who have not had 334.

635 **Educational Psychology.** (Psych 635.) Treatment of the psychological factors involved in motivation and educational efficiency. Prerequisite: 334 or 634. Winter. Rec 3. Credit 3 Graduates who have not had 335.

636 **Educational Psychology.** (Psych. 636.) A critical view of the psychology of mass education as it concerns group action, crowd behavior, co-operation, social participation, psychology of modern leisure and culture. Prerequisite. 334 or 634. Alternate years Offered Fall, 1936. Rec 3 Credit 3.

644 **Administrative Organization and Finance of Rural Education.** State and county school systems, inequalities, centralization and consolidation, state and federal aid, plans for raising and distributing school funds. Summer, second term. Rec. 4. Credit 2. Mr. Morgan.

645 **Administration and Supervision of Personnel.** Ethical relationships and management of personnel in village and consolidated schools, including school boards, teachers, pupils, bus drivers, and janitors. Summer, first term. Rec. 6. Credit 3. Mr. Morgan.

650. **Research in Industrial Arts Education.** (I. A. 650.) Messrs Hunter, Livingston.

664. **College Administration Problems.** Lectures and discussions relating to college and university administration for the general information of graduate students expecting to enter the profession of teaching. Winter. Rec 3. Credit 3 Mr. R. M. Hughes, Mr. Friley.

665. **Seminar in Problems of College Teaching.** For staff members of Iowa State College and of other colleges and universities. Fall, Winter, Spring. Rec. 1. Credit 1. Mr. Starrak.

684. **Current Educational Movements.** Major trends and problems in modern education. Selection of special courses and problems for graduate research. Fall, Winter, Spring. Rec 3. Credit 3. Messrs. Hamlin, Starrak, Sexauer.

TEACHERS' CERTIFICATES

STATE CERTIFICATES. In accordance with the law passed by the Forty-fifth General Assembly, the State Board of Educational Examiners will grant a standard secondary certificate to any graduate of the Iowa State College who has completed the following work.

	Quarter Credits
1. Professional training	
a. Instroduction to, history of, or principles of education	4½
b. Psychology and its application to education including measurements	9
c. Methods of teaching	4½
d. Directed observation and supervised student teaching	4½
	22½

Note. In addition to the above requirements, each candidate for a state certificate must have taken a college course in the Fundamental Principles of a Republican Form of Government and the Constitution of the United States and of the State of Iowa. This requirement is met by credit in Government 214 or 315.

Teacher Placement

The Committee on Appointments seeks (1) to aid adequately prepared students and graduates in securing positions as teachers; (2) to give service to superintendents and school boards who are in need of teachers. Calls for teachers are referred to this committee. The fee for enrollment is $2.00 for residents of Ames and $4.00 for non-residents. Those wishing to enroll should apply at Room 203, Agricultural Annex.

ZOOLOGY AND ENTOMOLOGY

C. J. DRAKE, Head of Department

Professors Becker, Knight, Richardson, Wellhouse; Associate Professors Harris, Lucas, Park, Smith, Yeager; Assistant Professor Hendrickson; Instructors Adams, Roudabush, Tauber; Graduate Assistants Davis, Fisher, Gunderson, Myers, Snipes, Tuthill; Teaching Fellows Gaines, Sooter

Extension Workers Decker, Paddock, Worthington

For information concerning the Division of Industrial Science, see page 69.

The work in the department as a whole is largely foundation work, which gives that knowledge of the biological laws and the data neces-

sary for profitable specialization in the lines of animal husbandry, veterinary medicine, and home economics, as well as other lines in industrial science and agriculture. For this work the zoological laboratories are well equipped with apparatus and materials.

The department also offers special training in a number of applied lines, such as economic zoology, parasitology, protozoology, physiology, entomology, and apiculture, in which students may specialize and prepare for important positions in government, state, municipal, or industrial work. For men and women proficient in such lines, there has always been a greater demand than could be supplied.

The instruction in zoology, physiology, entomology, and apiculture is given in Science Hall. Laboratory work in zoology, embryology, and entomology is given in the basement of Physics building. The general museum is housed on the top floor of Morrill Hall. This museum is open during the week days, and visitors as well as students will find that much time can be profitably spent in it. The insect collections are kept in proximity to the entomological laboratories. They contain over seventy thousand mounted specimens. In them are found many types, including those of the collections of Van Duzee and of Osborn and Ball.

Curriculum in Industrial Science—Major Zoology

For Freshman and Sophomore years, see page 226.

For general directions concerning work of Junior and Senior years, see page 227.

Graduate Curricula

For general information concerning graduate work, see page 100. A full description of this work is given in the graduate catalogue. Graduate curricula leading to the degrees of Master of Science and Doctor of Philosophy are offered in the fields of animal biology, morphology, ecology, taxonomy, physiology (comparative and insect physiology), protozoology, parasitology, entomology, apiculture, and economic zoology.

Description of Courses

104, 105. **General Biology.** Introduction to the foundations of life; the laws of nature as revealed in the simplest living organisms and in the higher animals. (104) Fall, Winter, Spring. (105) Fall, Winter. Lecture 2 or 3. Lab. 1, 3 hr. Credit 3 or 4 each course.

111, 112, 113. **Animal Biology.** General zoology including observation and study of the life-activities of representative animals with discussion of the fundamental principles of animal life. For Industrial Science students, particularly, majors in zoology and Preveterinary and Premedical students. Fall, Winter, Spring, respectively. Rec. 2. Lab. 2, 3 hr. Credit 4 each course.

114, 115. **Animal Biology.** Animal life of farm, woodland, prairie and fresh water. Designed for students in Industrial Science, Agriculture and Forestry. (114) Winter. Rec. 2. Lab 1, 3 hr. Credit 3. (115) Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

124. **General Zoology.** A brief course in the principles of zoology with emphasis on the higher forms. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

203. **Human Biology.** An outline of evolution from sub-human to human, the fossil record, the anatomy and embryonic development of the human body. Prerequisite: 105, or equivalent. Spring. Rec. 3. Credit 3.

224. **Comparative Anatomy.** A comparative study of the anatomy of the vertebrates. Dissection of principal types and demonstration of special structures. Prerequisite: general zoology or biology. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

234. **Embryology.** Animal development, mainly of vertebrates, principles and processes, germ cell origin and structure, maturation, fertilization, cleavage, cell layers, tissue and organ formation, foetal membranes and their uses. Prerequisite: General biology or zoology. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4.

255. **Physiology of the Human Body.** A general course covering the fundamental facts and principles of physiology, primarily for students of Home Economics and Industrial Science. Prerequisite: 104, 111, or 114; and Chem. 102 or 106. Fall, Winter, Spring. Lect. 3. Lab. 2, 3 hr. Credit 5.

274. **Elementary Entomology.** Structure, habits, life-histories and classification of insects, designed as a foundation for economic or advanced entomology. Fall, Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

315. **Bird Study.** Identification, habits, and economic importance of Iowa birds. Birds of the vicinity observed under guidance. Spring. Rec. 1. Lab. 1, 3 hr. Credit 2.

374. **Farm Insects.** The life history, recognition, and control of the principal insects and other arthropods attacking plants and animals. Winter, Spring. Lect. 2. Lab. 2, 3 hr. Credit 4. An additional laboratory period on insecticides (credit 1) illustrating the principles of insect control and practice. Credit 5.

375. **Fruit Pests.** Identification, life history and methods of control of the more important insect pests of orchard and small fruits. Prerequisite: 274 or 374. Spring. Rec. 3. Lab. 2, 3 hr. Credit 5.

377. **Forest Insects.** Life-histories and habits of the more important insects injurious to forests, forest products, and ornamentals. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

378. **Greenhouse and Truck Crop Pests.** Pests encountered by the florist and market gardener, with control measures adapted to their conditions. Prerequisite: 274. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

384. **Elementary Apiculture.** General principles necessary to the successful operation of a few colonies. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

385. **Life and Habits of the Honeybee.** The honeybee from the biological and cultural rather than from the commercial point of view. Fall. Lect. 2. Credit 2.

424. **Histological Technique.** Methods of fixing, sectioning, mounting, and staining tissues for microscopic study. Prerequisite: General or animal biology. Fall. Lect. 1. Lab. 2, 3 hr. Credit 3.

429. **Special Problems in Zoology, Physiology, Entomology, and Apiculture.** Individual problems to begin research and to find the literature. Prerequisite: 113, 115, or equivalent. Credit 2 to 5.

454. **Applied Anatomy and Kinesiology.** Physiology of muscular exercises. Prerequisite. 255. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

456. **Nutritional Physiology.** Digestion, absorption, metabolism, excretion and secretion. Prerequisite: 255. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3.

484. **Insect Morphology.** Gross morphology of typical insects with special attention to structure emphasized in economic and systematic entomology. Prerequisite: 274. Fall. Lab. 3, 3 hr. Credit 3.

499. **Methods in Teaching Animal Biology and Physiology.** (Voc. Ed. 499.) Study and observation of methods and practical devices in teaching. Prerequisite: 15 credits of zoology including one year of introductory biology. Spring. Rec. 3. Credit 3.

504. **Game Birds and Mammals.** Identification of common game species of birds and mammals, including fur-bearers, of North America, particularly of the North-Central States; life histories; habits; general management; game laws. Prerequisite: 105, 113, 115, or 124. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3.

506. **Fishes.** Identification of common game and soft fishes, frogs, and mollusks of North America, particularly of North-Central States; life histories; habits; general management; and laws. Prerequisite: 105, 113, 115, or 124. Spring. Lect. 2. Lab. 1, 3 hr. Credit 3.

508. **Techniques in Wildlife Management.** Preparation of study mounts of birds, mammals and other game species, food-habits analysis, census methods, collection of data, mapping management areas, and literature. Prerequisite: 504. Winter. Lect. 1. Lab. 2, 3 hr. Credit 3.

510. **Parasites of Game Animals.** Identification, life histories, and distribution of protozoan, helminth, and arthropod parasites of game and other wild birds and mammals. Prerequisite: 113. Spring. Lect. 2. Lab. 2, 3 hr. Credit 4.

514. **Parasites and Disease Carrying Insects.** Advanced study of pathogenic protozoa, worms, leeches, external parasites and disease-carrying mites and insects. Prerequisite: 105, 113, or 115. Winter. Rec. 2. Lab. 2, 3 hr. Credit 4.

515. **Protozoology.** Free-living and parasitic protozoa. Prerequisite: General biology or zoology. Fall. Lect. 2. Lab. 2, 3 hr. Credit 4.

516. **Field Zoology.** Primarily for students and teachers, to acquaint themselves with the fresh water and land fauna of a locality. Methods of collecting, identifying, and preserving material. Micro-preparations of the smaller invertebrates and animal tissues. Opportunity for making a personal collection for teaching purposes. Prerequisite: general zoology or biology. Summer, first term. Lect. 4. Lab. 4, 3 hr. Credit 4.

517. **Invertebrate Zoology.** Advanced study of the invertebrate phyla. Economic relations, classification, and structure. Prerequisite: 105, 113, 115, or equivalent. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

519. **Taxonomy and Ecology of Vertebrates.** Advanced study of classification, habits and relationships of world wide vertebrates, including migration, establishment and range of existing species. Prerequisite: 115. Alternate years. Winter, 1938. Lect. 3. Lab. 1, 3 hr. Credit 4.

520. **Wildlife Management.** Special reference to game birds. The basic principles in the management of wild game birds and fur-bearing animals. Co-ordination of such management with timber and farm crop production, recreation, and other land uses. Federal and state legislation for the protection of wildlife, with reference to recent trends. Field work in planning of preserves and other land areas; visits to areas under actual management. Prerequisite: 504. Alternate years. Offered Winter, 1937. Lect. 3. Lab. 1, 3 hr. Credit 4.

525. **Seminar in Zoology, Physiology, and Entomology.** Reports of original investigations, current literature, special lectures. Fall, Winter, Spring. Credit 1.

526. **Cytology.** The animal cell as related to development and inheritance. Prerequisite: 424 or equivalent Spring. Rec. 2. Lab. 2, 3 hr. Credit 4.

527. **Normal Histology.** Microscopic structure of the fundamental and special tissues of the vertebrate in relation to development and function. Prerequisite: 113 Winter. Rec 2. Lab. 2 or 3, 3 hr. Credit 4 or 5.

534. **Embryology.** Development, principles and processes, using vertebrate embryos Germ cell origin and structure, maturation, fertilization, cleavage, differentiation, tissue formation, organogeny. Prerequisite: General biology or zoology. Fall Lect 2. Lab. 1, 3 hr. Credit 3.

557 **Applied Physiology.** Physiology of circulation, respiration, blood and lymph Selective experiments with practice in technical methods Prerequisite 255 Spring Lect 2. Lab 1, 3 hr. Credit 3.

558 **Child Physiology.** A survey of the processes of growth and development, including racial, dietary, climatic, inherited, and glandular influences Prerequisite· 255. Winter. Lect 2. Lab. 1, 3 hr. Credit 3.

564 **Physiology of the Nervous System and Special Senses.** The brain, eye, ear, etc. Prerequisite: 255. Fall. Lect. 2. Lab. 1, 3 hr. Credit 3.

565. **General Animal Physiology.** Life processes of cells and cell groups. Prerequisite: 105 or 113, and one year of Chemistry. Fall. Rec. 2. Lab. 2, 3 hr. Credit 4.

566. **Insect Physiology.** Life processes of insects and related forms. Prerequisite 274, 484, 565. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4.

576, 577. **Systematic Entomology.** Classification, nomenclature, and taxonomic practice. Students may select a particular group and make a private collection Prerequisite 274 or 374. Winter, Spring, respectively. Rec. 1. Lab. 2, 3 hr. Credit 3 each course.

578 **Animal Ecology.** Relation of animals to their natural environment; geographical distribution, climatic factors, ecological succession Field and experimental work. Prerequisite. 113 or 115, 274. Spring. Lect 3 Lab. 1, 3 hr. Credit 4.

585. **Field Entomology.** A survey of the insect world, including classification, life histories, literature, and ecology. Emphasis on field observations and on making and naming a personal collection of insects Prerequisite general biology or zoology. Summer, second term. Rec 4. Lab 4, 3 hr. Credit 4.

594. **Advanced Apiculture.** The biology and behavior of the honeybee together with its management for the production of honey. Prerequisite: 274 or 374, and 384. Spring. Rec. 2. Lab. 1, 3 hr. Credit 3.

617. **Evolution of Animals.** Problems and factors in organic evolution, heredity, variation, origin, and distribution of life. Prerequisite: General biology or zoology. Spring. Lect. 2. Credit 2. Mr. Wellhouse.

624. **Vertebrate Zoology.** The chordate animals, placing emphasis on morphology and relationships of types Prerequisite: 113, or equivalent. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4 Miss Smith.

665. **Insect Toxicology.** Quantitative methods for the study of insect toxicology; theories of the action of poisons; history of insecticides; preparation and application of insecticides Prerequisite: 274, 374, 566. Spring. Rec. 2. Lab. 2, 3 hr. Credit 4. Mr. Richardson

674. **Applied Entomology.** Identification, ethology, and geography of insect pests. Principles and methods of chemical and natural control. Prerequisite: 105, 113 or 115, 274, 374. Spring. Rec. 3. Lab. 1, 3 hr. Credit 4. Mr. Drake.

677. **Literature of Zoology and Entomology.** Review of important literature and classical authors; bibliography, nomenclators and rules of zoological nomenclature Prerequisite: 113 or 115, and 274, 374. Alternate years. Offered Fall, 1937. Lect. 3. Credit 3. Mr. Knight.

684. **Advanced Insect Morphology.** The structure, development, reproduction, and homologies of various groups of insects. Prerequisite: 484, or equivalent. Winter. Lect. 3. Credit 3. Mr. Wellhouse.

690. **Research.**
A. Zoology. Messrs. Becker, Lucas, Hendrickson, Errington.
B. Physiology. Miss Smith, Mr. Yeager.
C. Entomology. Messrs. Drake, Richardson, Wellhouse, Knight, Harris.
D. Apiculture. Mr. Park.

Non-Collegiate Work

The curricula described on the following pages are open to young men seventeen or more years of age who have had at least an eighth grade preparation. The primary object of these curricula is to train young men for definite vocational work.

CURRICULA IN AGRICULTURE

DEAN KILDEE, Agricultural Hall, Room 123N

Four-Quarter Curriculum for Creamery Operators. See page 287.
Two-Quarter Curriculum for Herdsmen. See page 288.

REQUIREMENTS FOR ADMISSION TO NON-COLLEGIATE CURRICULA

Every applicant for admission to a non-collegiate curriculum must be at least seventeen years of age and must present a certificate signed by his county or high school superintendent showing that he has satisfactorily completed the eighth grade of the public schools or its equivalent. If the applicant has attended high school this certificate must also give his complete high school or academic record. This certificate should be filed with the Registrar as promptly as possible, and at least two weeks before the opening of the quarter. Formal application for admission must be filed by each applicant. Blank forms can be secured by writing to the Registrar.

These curricula are intended for the young man who is unable to enter the regular four-year curricula or who wants a short practical preparation for some special vocation.

FEES AND EXPENSES. See page 45.

DEFINITION OF A CREDIT. The value of each course is stated in quarter-credits. A credit requires one recitation (involving two hours of preparation), or one three-hour laboratory period or other combination of teacher contact and outside preparation involving a total of three clock hours per week for twelve weeks.

COURSE NUMBERS. In each department the courses, for convenience of reference, are given in numerical order. Non-collegiate courses are numbered from 1 to 99.

AGRICULTURAL ENGINEERING

PROFESSOR DAVIDSON, Agricultural Engineering Laboratory, Room 112

Description of Courses

65. **Power and Machinery.** Selection, repair, and management of mechanical farm equipment. Rec. 1. Lab. 2, 3 hr. Credit 3.

69. **Dairy Machinery.** For Dairymen. Construction and operation of steam boilers and engines, gas engines, refrigerating machines, line-shafting, pulleys and belting; pipe fitting and soldering. Fall. Rec. 2. Lab. 1, 3 hr. Credit 3.

70. **Management of Farm Equipment.** Design, selection and utilization of farm buildings; selection, operation and utilization of power and machinery units used in crop production and feed processing. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

AGRICULTURE

Curriculum for Creamery Operators

This twelve-months curriculum includes manufacture of the various milk products and the handling of market milk. The laboratories in the new dairy industry building are provided with the most modern equipment and the manufacturing work is conducted on a commercial basis.

The object of this curriculum is to fit the students for positions as butter, cheese, and ice cream makers, market milk operators or managers of dairy plants.

After completing the first two quarters' work each student is required to engage in practical dairy work in a commercial dairy plant at least five months before returning for the balance of the curriculum.

At the close of the fourth quarter, one week will be devoted to oral and written examinations over the technical dairy subjects. Those who successfully complete the prescribed curriculum with an average of at least 2 quality points per credit and satisfactorily pass the final examinations over the technical subjects will be granted a certificate.

Since this curriculum is planned as a unified sequence new students are admitted only at the beginning of the Fall Quarter.

First Quarter (Fall)	Credits	Second Quarter (Winter)	Credits
Dairy Practice D.I. 11	5	Dairy Practice D.I. 12	4
Testing Milk and Milk Products D.I. 15	3	Buttermaking D.I. 17	2
Buttermaking D.I. 16	3	Cheese Making D.I. 29	4
Dairy Chemistry Chem. 38	2	Ice Cream Making D.I. 20	3
Creamery Mathematics Math. 6	2	Cattle Feeding and Management A.H. 31	2
Practice of English Engl. 6	3	Good Reading Engl. 8	3
	18		18

In addition to the courses listed above, each student will be required to include in his schedule: Phys.Ed. 11, 12.

Third Quarter (Fall)	
Dairy Practice D.I. 13	2
Factory Management D.I. 30	4
Dairy Bacteriology D.I. 54	3
Dairy Machinery A.E. 69	3
Creamery Accounting Ec. 24	2
Breeding and Judging Dairy Cattle A.H. 30	2
Farm Crops Production F.C. 1	3
*Agr. 11	R
	19

Fourth Quarter (Winter)	
Dairy Practice D.I. 14	2
Market Milk D.I. 21	3
Condensed and Powdered Milk D.I. 22	2
Judging Dairy Products D.I. 25	1
Special Problems D.I. 26	2
Dairy Bacteriology D.I. 55	3
Creamery Accounting Ec. 25	4
	17

*For Creamery Operators' Curriculum. Five months' experience will be required in a creamery or other dairy establishment between the second and third quarters of the curriculum.

Curriculum for Herdsmen

Upon completion of this curriculum and one year of successful work with livestock, a statement will be granted showing completion of the curriculum.

The Herdsmen's Curriculum is a two-quarter curriculum designed to meet the needs of young men who are primarily interested in livestock. Opportunity is afforded the students for some specialization in the class of livestock in which they are most interested.

Instruction will be offered in two periods; the first from January to March 1937, the second from January to March the year following. The students are expected to spend the time between the two periods gaining additional experience in their chosen line.

This curriculum is most practical in nature and includes sufficient general work in agriculture so as to fit men for general livestock farming, dairy farming, herd management, or cow-testing association supervision.

FIRST QUARTER	Credits
Types of Livestock A.H. 21	3
General Livestock Feeding and Mgt. A.H. 28	4
Farm Crop Production F.C. 2	4
Poultry Husbandry A.H. 40 or	2
Farm Sanitation Vet. 3	
Th · Practice of English Engl. 6 or	3
The Informational Article Engl. 7	
Management of Farm Equipment A.E. 70 or	3
Milk Testing D.I. 27	
	19

SECOND QUARTER	Credits
Advanced Breed Studies A.H. 22	4
Production and Mktg. of Livestock A.H. 20	3
Animal Breeding A.H. 51	2
Obstetrics Vet. 4	2
Livestock Advertising T.Jl. 25	2
Farm Management Ec. 36	3
	16
Suggested Electives	
Farm Meats A.H. 71	2
Poultry Management A.H. 40	2

Description of Courses

3 For the Herdsmen's Curriculum, one year's successful work with livestock or as cow-test association supervisor will be required after the completion of the curriculum before a statement showing the completion of the curriculum will be granted.

11. For the Creamery Operators' Curriculum. Five months' experience will be required in a creamery or other dairy establishment between the second and third quarter of the curriculum.

AGRONOMY

ASSISTANT PROFESSOR ELDREDGE, Agricultural Hall, Room 304

Description of Courses

1. **Farm Crop Production.** Dairymen. Principles of crop production including choice of crops and varieties; selecting and purchasing seed; seedbed preparation, cultural operations, and harvesting. Fall. Rec. 2. Rec. and lab. 1, 2 hr. Credit 3.

2. **Farm Crop Production.** Principles of crop production including choice of crops and varieties, selecting and purchasing seed, seedbed preparation, care during growth, and harvesting. Brief study of soils, including maintenance of tilth, rotations, manuring, soil acidity, liming, and phosphates. Winter. Rec. 2. Rec. and lab. 2, 2 hr. Credit 4.

ANIMAL HUSBANDRY

PROFESSOR W. F. LAGRANGE, Agricultural Hall, Room 105

Associate Professor Hansen; Assistant Professor Holbert

Description of Courses

20. **Production and Marketing of Livestock.** Feeding of different classes of livestock for market production. Prerequisite: 28. Winter. Rec. 3. Credit 3.

21. **Types and Market Classes of Livestock.** Judging, types, carcasses, markets and market classification. Winter. Rec. and lab. 3, 2 hr. Credit 3.

22. **Advanced Breed Studies.** Judging, origin, development, characteristics, bloodlines, and families. Prerequisite: 21. Winter. Rec. 2. Rec. and lab. 2, 2 hr. Credit 4.

28. **General Livestock Feeding and Management.** Feed stuffs, compounding and balancing rations, practical care, feed and management of livestock. Winter. Rec. 3. Lab. 1, 3 hr. Credit 4

30. **Breeding and Judging of Dairy Cattle.** Principles and practices of selection and breeding of productive herds. Fall. Rec. 1. Rec. and lab. 1, 2 hr. Credit 2.

31. **Dairy Cattle Feeding and Management.** Winter. Rec. 2. Credit 2.

40. **Poultry Management.** Culling and selecting, housing, feeding, brooding, fattening, marketing of poultry, and grading of eggs. Rec. and lab. 2, 2 hr. Credit 2.

51. **Animal Breeding.** Principles of livestock breeding, selection and improvement of herds and flocks. Winter. Rec. 2. Credit 2.

71. **Farm Meats.** Killing, cutting and curing of farm meats. Prerequisite: 21. Rec. 1. Lab. 1, 3 hr. Credit 2.

CHEMISTRY

Chemistry Building, General Office, Room 202

PROFESSOR J. H. BUCHANAN

Description of Courses

38. **Dairy Chemistry.** For Dairymen. Chemistry for the dairy and creamery. Fall. Rec. 1. Lab. 1, 3 hr. Credit 2.

DAIRY INDUSTRY

ASSOCIATE PROFESSOR E. F. Goss, Dairy Industry Building, Room 102B
Instructors Hostetler, TeSelle

Description of Courses

11, 12, 13, 14. **Dairy Practice.** Buttermaking, cheesemaking, ice cream making, market milk, preparation of starters, testing milk and milk products and refrigeration plant operation. Special work in the last two quarters. (11) Fall. Lab. 5, 3 hr. Credit 5. (12) Winter. Lab. 4, 3 hr. Credit 4. (13) Fall. Lab. 2, 3 hr. Credit 2. (14) Winter. Lab. 2, 3 hr. Credit 2.

15. **Milk Testing.** Composition of milk. The Babcock test and various other tests employed in the dairy manufacturing plant. Fall. Rec. 3. Credit 3.

16, 17. **Buttermaking.** Quality of milk and cream, separation of milk, cream ripening, starters, churning, and preparing butter for market. (16) Fall. Rec. 3. Credit 3. (17) Winter. Rec. 2. Credit 2.

29. **Cheesemaking.** Principles of cheesemaking and manufacture of soft cheese. Cheddar and other cured cheese, manufacture, curing, and marketing. Winter. Rec. 4. Credit 4.

20. **Ice Cream and Ices.** Selection and preparation of materials, processing and merchandising of plain and fancy ice creams and related products. Winter. Rec. 3. Credit 3.

21. **Market Milk.** Methods used in the preparation of milk and cream for market. Winter. Rec. 3. Credit 3.

22. **Condensed and Powdered Milk.** Manufacture of condensed and powdered milk. Winter. Rec. 1. Lab. 1, 3 hr. Credit 2.

30. **Factory Management.** Underlying principles of the management of creameries and other dairy plants. Fall. Rec. 4. Credit 4.

25. **Judging Dairy Products.** Milk, cream, butter, cheese, and frozen dairy products; special attention to score cards. Winter. Rec. 1. Credit 1.

26. **Special Problems.** A review of technical subject matter followed by an examination over all technical subjects. Winter. Rec. 2. Credit 2.

27. **Separation and Milk Testing.** For Herdsmen. Separation, care of milk and cream, and milk testing. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

54, 55. **Dairy Bacteriology.** (54) Importance of bacteria in dairy products. Determination of numbers and types of bacteria in dairy products and their significance. Fall. (55) Continuation of 54. Winter. Rec. 1. Lab. 3, 2 hr. Credit 3 each course.

ECONOMICS AND SOCIOLOGY

CHAS. M. ELKINTON, Agricultural Annex, Room 207

Description of Courses

24, 25. **Creamery Accounting.** Bookkeeping methods and accounting procedure for country creameries. Fall, Winter, respectively. Fall. Lect. 1. Lab. 1, 3 hr. Credit 2. Winter. Lect. 2. Lab. 2, 3 hr. Credit 4.

36. **Farm Management.** Principles. Farm records and their use. Winter. Rec. 2. Lab. 1, 3 hr. Credit 3.

37. **Farm Management.** General principles of farm management Farm accounting. Use of farm accounts in farm organization and operation. Winter. Rec. 3. Lab. 2, 3 hr. Credit 5.

46. **Marketing Agricultural Products.** Structure of markets, market practices, private and co-operative organization, government agency and regulation. Winter. Rec. 3. Credit 3.

ENGLISH

PROFESSOR J. R. DERBY, Central Building, Room 18
Instructor Fleming

Description of Courses

4. **Preparatory English.** A review of the fundamentals of grammar. Application of grammar to composition. Fall, Winter, Spring. Rec. 3. No credit.

5. **Remedial English.** Additional drill for students who have received a "condition" in English. Remedial work suited to the needs of individual students and offered by tutor in private conference. To be arranged.

6. **Composition, Oral and Written.** The practice of English; notetaking; writing of business letters. Fall, Winter. Rec. 3. Credit 3.

7 **The Informational Article.** Writing of such articles as the student may be asked to prepare for special occasion, and for publication. Winter. Rec. 3 Credit 3.

8. **Good Reading.** Training in how and what to read. Winter. Rec. 3. Credit 3

MATHEMATICS

ASSOCIATE PROFESSOR HERR, Central Building, Room 201
Instructor Catlin

Description of Courses

4. **Algebra Review.** A special course to which freshman students showing deficient preparation in mathematics are assigned by the Dean of the Junior College and the Dean of the Division. Fall, Winter, Spring. Rec. 5. Credit 5.

5 **Advanced Algebra.** Satisfies the requirements for the third half-unit of entrance algebra. Prerequisite: One year of high school algebra. Fall, Winter, Spring. Rec. 5. Credit 5.

6. **Creamery Mathematics.** Principles of mathematics needed in practical problems of dairy plant management. Fall. Rec. 2. Credit 2.

36. **Solid Geometry.** Fall Prerequisite: Plane Geometry. Rec. 3. Credit 3.

MUSIC

PROFESSOR MACRAE, Music Hall, Room 1

Description of Courses

11, 12, 13 **Band.** Open to all students by competitive examination. Concerts are given during the year.

51, 52, 53. **Orchestra.** Designed for students who have made a beginning on an orchestral instrument. Standard works are given in concert during the year. Credit 1 each course.

PHYSICAL EDUCATION (For Men)

PROFESSOR G. F. VEENKER, Gymnasium

Associate Professors Menze, Otopalik, Simpson; Assistant Professors Daubert, Schmidt, Truskowski; Instructors Timm, Yeager

Description of Courses

11, 12, 13. **Physical Education.** First year. Mass activities, corrective exercises, swimming, athletics and games. Fall, Winter, Spring, respectively. Lab. 2, 1 hour each quarter; required.

11C, 12C, 13C. **Individual Physical Education.** First year On recommendation of Hygiene Department in substitution for 11, 12, 13. Fall, Winter, Spring. Lab. 2, 1 hour each quarter.

21, 22, 23. **Physical Education.** Second year. Advanced work. Prerequisite: 11, 12, 13. Fall, Winter, Spring, respectively. Lab. 1, 1 hr. each quarter; required.

21C, 22C, 23C. **Individual Physical Education.** Second year On recommendation of Hygiene Department in substitution for 21, 22, 23. Fall, Winter, Spring. Lab. 1, 1 hour each quarter.

TECHNICAL JOURNALISM

PROFESSOR BLAIR CONVERSE, Agricultural Annex, Room 102

Description of Course

25 **Livestock Advertising.** For Herdsmen. Advertising as it relates to livestock selling. Second year. Rec. 2. Credit 2.

VETERINARY MEDICINE

Description of Courses

3. **Farm Sanitation and Communicable Diseases.** For Herdsmen General consideration of the causes and spread of diseases, disinfectants and their application; general hygiene and stable sanitation. Winter. Rec. 2. Credit 2

4. **Obstetrics.** Anatomy and physiology of the genital organs of the male and female, ovulation, oestrum, fecundation, gestation, parturition, sterility, hygiene of pregnant animals and care of the new born Winter. Lect. 2. Credit 2.

School of Music

(Affiliated)

For Department of Music, see page 247.

Tolbert MacRae, Head of Department . . . . . Professor of Music
Oscar Hatch Hawley . . . . . Associate Professor of Music
A. R. Edgar . . . . . Assistant Professor of Music
Rosalind Cook . . . . . Instructor of Piano
Ira Schroeder . . . . . Instructor of Piano
Ilza Niemack . . . . . Instructor of Violin

The purpose of the School of Music affiliated is to provide for the students' proper instruction in vocal and instrumental music and the opportunity of the cultural advantage in singing and playing in the different ensemble organizations which are under the direction of the members of the music faculty.

Students must register at Music Hall each quarter before they begin their lessons. Students who register late will not be charged for lessons missed because of late registration. All fees are payable at the Treasurer's Office before the registration is complete. Single lessons will be charged at the rate of $2.00 and $2.50.

TUITION FOR EACH QUARTER FOR PRIVATE LESSONS

Voice—12 lessons per quarter	$20.00
24 lessons per quarter	40.00
Piano—12 lessons per quarter	16.00
24 lessons per quarter	32.00
Piano—10 private lessons with 10 lessons in class } for children under 12 years of age	12.00
10 lessons private—for children under 15 years of age	12.00
Band Instruments—12 lessons per quarter	16.00
24 lessons per quarter	32.00
Ensemble class of orchestra and band instruments, (1-hr. period, once a week) 10 to 15 in class, each	5.00
Harmony, ear training, sight reading, (1-hr. period, twice a week) 10 to 15 in class, each	5.00
Violin—12 lessons per quarter	16.00
24 lessons per quarter	32.00
Piano practice, one hour each day for the quarter	3.00

MUSICAL ORGANIZATIONS

The following musical organizations are maintained by the College: a men's Glee Club, women's Glee Club, Festival Chorus, Symphony Orchestra, and Concert Band. All of these societies give concerts during the year, and the Glee Clubs go on concert tours.

MUSICAL ATTRACTIONS

Eminent artists and musical organizations are brought to the College each year. Among those who have appeared are the Minneapolis Symphony Orchestra (5), The United States Marine Band, Maud Powell, Julia Culp, the New York Symphony Orchestra, the late David Bispham, Evan Williams, Louise Homer (2), Mischa Elman (3), Anna Case (2), Josef Hoffman, Mme. Schumann-Heink (2), Mme. Gadski, May Peterson, Casals, the Kneisel String Quartet, the Zoellner String Quartet, John McCormack (2), Rudolph Ganz, Frances Alda, John Philip Sousa and his band, Florence Hinkle, Arthur Middleton, Jan Kubelik, Riccardo Martin, Frances Ingram, Alberto Salvi (2), Maurice Dumesnil, Amelita Galli-Curci (3), Geraldine Farrar, Sergei Rachmaninoff, Fritz Kreisler, Louis Graveure (3), Emil Telmanyi, Irene Pavlovska, Forrest Lamont, Virgilio Lazarri, Tito Schipa, Tamaki Miura, San Carlos Grand Opera Co., Albert Spaulding, Paul Whiteman and Orchestra, Toti Dal Monte, Ignatz Friedman, The De Reszke Singers, Lambert Murphy, Merle Alcock, Marion Talley, Cyrena Van Gordon, London String Quartet, Russian Symphonic Choir, José Iturbi. Heinrich Schlusmus, Claire Dux, Kathryn Meisle, Walter Gieseking, John Charles Thomas, Don Cossack Male Chorus.

The Summer Quarter, 1936

Raymond M. Hughes, President, Central Building.
C. E. Friley, Vice President, Central Building.
James R. Sage, Registrar, Central Building.
C. B. Murray, Treasurer, Central Building.
John E. Foster, Dean, Agricultural Annex.

GENERAL STATEMENT

The twenty-sixth Summer Quarter of Iowa State College will open June 16 and will close August 29, 1936. The college year is divided into four periods of eleven to twelve weeks each, designated as the Fall, Winter, Spring, and Summer Quarters. For the convenience of students, the Summer Quarter is divided into two terms. The first term will extend from June 16 to July 23; the second term from July 23 to August 29. Since each term stands as a unit, subjects taught during each term have twice as many class and laboratory periods per week as do the same subjects taught during the Fall, Winter, and Spring Quarters. Therefore the student carries, in each term of the Summer Quarter, only one-half the normal number of subjects that he carries in the other quarters.

SUMMER QUARTER CATALOGUE

For details regarding any phase of the Summer Quarter please consult the Summer Quarter Catalogue, copies of which will be mailed on request. Inquiries should be addressed to the Dean of the Summer Quarter, Iowa State College, Ames, Iowa.

SPECIAL BULLETINS

Summer Quarter bulletins on agriculture, botany, home economics, industrial arts, psychology, and vocational education will be mailed upon request. Address the Dean of the Summer Quarter.

CORRESPONDENCE WITH DEPARTMENT HEADS

Prospective students desiring special information regarding any curriculum or course are urged to correspond with the head of the department concerned.

THE FACULTY

The instruction in the Summer Quarter will be given by a corps of about 180 teachers, nearly all of whom belong to the regular staff. The

subjects taught in the Summer Quarter will be given by the same specialists that teach them in the other quarters of the college year. Practically all of the heads of the departments and most members of the instructing staff of professorial rank are in residence during one of the summer terms. The opportunities for contact with leading educators in their respective fields are fully as great during the Summer Quarter as during the remainder of the year.

OPPORTUNITIES FOR UNDERGRADUATE STUDY

Undergraduate work is offered during the Summer Quarter in most of the departments of Iowa State College. The opportunity to secure such work should appeal to men and women of the following groups:

REGULAR STUDENTS. Students in residence during other quarters of the college year who have become "irregular" because they were not sufficiently prepared to enter technical courses or because they entered college in some quarter other than the Fall, will be enabled to remove their deficiencies. Students who expect to enter a technical course in the Fall Quarter, particularly engineering and industrial science, frequently find it advantageous to attend a term of the preceding Summer Quarter in order to meet fully the entrance requirements.

Many regular students find it possible to shorten their college courses or to lighten work of the other quarters by Summer Quarter attendance.

Students who plan to teach will find in the Summer Quarter an excellent opportunity to complete the work in psychology and in vocational education required by law.

TEACHERS, PRINCIPALS, AND SUPERVISORS who have not completed college courses leading to the bachelor's degree and who are particularly interested in agricultural education, home economics education, or education in industrial arts, and in the related sciences and technical subjects will be able to advance toward such degrees.

ANY MATURE INDIVIDUAL who satisfies the department concerned as to his ability to carry the work desired will be admitted without meeting the usual entrance requirements

OPPORTUNITIES FOR GRADUATE STUDY

That the Graduate College has become an important element in the make-up of Iowa State College is evidenced by the fact that during the school year 1934-35 there were enrolled 833 graduate students. They came from scores of colleges and universities, not only of the United States, but of the world. During the first and second terms of the 1935 Summer Quarter there were enrolled 540 graduate students.

It is the primary purpose of the Graduate College to give opportunity to carry into the graduate field the work of the various technical and scientific departments of the institution, and to encourage and foster research.

It has been only within recent years that enrollment has reached such large proportions, but graduate instruction has been offered and graduate

students have been registered for each year of the 64 years since the first class was graduated from Iowa State College.

The Summer Quarter offers an exceptional opportunity to the qualified student who plans to pursue graduate work at Iowa State College. Practically all departments of the institution offering major subjects retain in residence during one or both terms of the Summer Quarter, teachers particularly qualified to direct graduate study in their respective fields. In many subjects the Summer Quarter is the most satisfactory for graduate work. The entire laboratory, library, and instructional facilities are at the disposal of those who can profit by graduate work in the technical and related scientific fields.

An increasingly large proportion of the Summer Quarter students have been those who already have a baccalaureate degree and are interested in advanced or graduate work. Among those who find exceptional opportunity to advance themselves toward masters' or doctors' degrees are the following:

TEACHERS AND SUPERVISORS of agriculture, home economics, manual training, and industrial arts in the public schools, particularly high schools and consolidated schools, may pursue advanced courses relating to their particular fields. Those who are graduates in technical courses will usually be interested in securing advanced degrees by pursuing major work in certain departments in agriculture, engineering, home economics, etc., with minor work in vocational education, agricultural education, home economics education, or industrial arts; or by carrying major work in one of these special educational fields, with minor work in a chosen technical department.

SUPERINTENDENTS, PRINCIPALS, AND SUPERVISORS. The Summer Quarter is serving a most useful end in acquainting superintendents, principals, and supervisors with the recent phases of agriculture, home economics, and industrial arts, and in affording an opportunity for specialized instruction in vocational education.

TEACHERS OF THE SCIENCES. Excellent opportunities will be offered those who wish to pursue advanced courses in the biological sciences and in mathematics, physics, and chemistry.

REGULAR GRADUATE STUDENTS. Many of the graduate students of the regular college year find conditions during the Summer Quarter particularly advantageous for continuing their graduate work. Many research problems can be handled most satisfactorily during this period.

REQUIREMENTS FOR ADMISSION

The entrance requirements for the Summer Quarter do not differ from those for the other quarters of the college year. See page 36

CREDITS

Work completed in the Summer Quarter receives proportionate college credit on the same basis as during the other quarters of the college year.

For graduate students classification in courses carrying full graduate credit is limited to a maximum of eight credits per term. For undergraduates eight or nine credits per term constitute full work; the maximum number of credits for which any student may register during either term is ten, and then only upon previous demonstration of exceptional ability.

RESIDENCE REQUIREMENT

Attendance upon five summer terms is considered as meeting the residence requirement of one year in determining eligibility to the degree of Master of Science.

REGISTRATION FEE

For each term of the Summer Quarter the registration fee will be as follows:

Graduate College	$26.00
Graduate College, Staff Members	9.00
Division of Agriculture	$23.00
Department of Agricultural Engineering	$26.00
Division of Engineering	$28.00
Division of Home Economics	$26.00
Division of Industrial Science	$26.00
Division of Veterinary Medicine	$28.00

The fee per credit hour for less than full time is as follows: engineering, veterinary medicine, each $5.50; agricultural engineering, home economics, industrial science, graduate college, each $5.50; agriculture, $4.50. The minimum charge is $8.00.

The above registration fee is a general fee covering all miscellaneous charges such as laboratory fees, hospital fees, admission to the College entertainment series, etc.

MATRICULATION FEE

Each new student must pay a matriculation fee of $10 00. This fee is paid but once.

TUITION

All students who are non-residents of Iowa, except those in the Graduate College, will pay a tuition fee of $7 each term of the Summer Quarter in addition to the Registration Fee.

BOARD AND ROOMS FOR WOMEN

Women will arrange for rooms through the office of the Director of Housing. Undergraduate women students will be assigned to college dormitories. One dormitory will be reserved for graduate and mature students, but such students, if they so desire, may arrange for accommodations other than those provided in the dormitories.

Meals will not be served in the hall dining rooms during the Summer Quarter. Cafeteria service and dining room service are available at reasonable prices in the Memorial Union, which is situated on the main campus and near the residence halls. The price of rooms for each term is $16 per person, two in a room; $16 to $30 for a single room. A deposit of $5 is required to reserve a room. Mattresses only are furnished for the cots. Students should bring pillows, sheets, pillow cases, blankets, and spread.

BOARD AND ROOMS FOR MEN

Rooms for men will be available in private homes. The Secretary of the Y. M. C. A. Alumni Hall has a list of approved rooms in private homes and rooming houses. The cafeteria in Memorial Union will be open during the entire Summer Quarter.

EXPENSES

Total expenses will vary with the individual. For each half of the Summer Quarter, the fixed expenses consisting of room, board, and the registration fee need not exceed $70 to $75 for either men or women. The foregoing does not include books,

STUDENT HEALTH SERVICE

The college hospital and dispensary will be open throughout the first term of the Summer Quarter; during the second term dispensary service is available. The privileges of the hospital and dispensary are extended to all students who pay the full registration fee.

SOCIAL LIFE AND RECREATION

Social gatherings of students and faculty, picnics, and informal dances will be arranged. The Y. M. C. A. and Y. W. C. A. will sponsor "Mixers" each term. A choral society made up of students and faculty members will be organized the first term under the direction of Professor Tolbert MacRae. Those interested in tennis, baseball, track, or indoor gymnasium work will find ample facilities for these activities. The swimming pool in the men's gymnasium will be open each afternoon from four to five-thirty.

CONVOCATIONS FOR CONFERRING DEGREES

At the close of each term of the Summer Quarter a convocation will be held for the purpose of conferring degrees.

SUMMER QUARTER NEWS

The Summer Quarter News is an official weekly publication of the College. Copies may be obtained gratis each Thursday at the following places: Summer Quarter Office, Room 203, Agricultural Annex; Campus Book Store; Memorial Union; Registrar's Office, 107 Central Building.

Short Courses

R. M. Vifquain, Chairman

Short courses held at Iowa State College last year attracted a total of 9,247 adults and young people, 1,880 more attendants than during the previous year. Four new short courses, Country Life Institute, Dairy Day, High School Press, and Nurserymen, were held. Yearly an increasing number of groups finds worth-while the round-table discussions and educational meetings in the fields of agriculture, home economics, and engineering.

Anyone concerned with the problems or interested in information presented at the meetings is invited to attend. Iowa State short courses are conducted for two major purposes: First, to provide opportunity for men and women of the same profession, trade, or business to meet and discuss their mutual problems; and, second, to enable the individuals to discuss and study their problems with college specialists in the light of most recent research findings. Each course, naturally, is limited in scope and time and deals directly and practically with the field indicated. The exact dates for each short course are usually not set until two or three months prior to holding the course.

The short course bulletin illustrating and giving a descriptive write-up of each course is printed October 15th each year. A copy may be had upon request.

CHRONOLOGICAL LIST OF SHORT COURSES

1935

Sewage Treatment	Oct. 31, Nov. 1
Midwest Gas School and Conference	Nov. 6-9
Poultry Breeders	Nov. 18, 19
Beekeepers	Nov. 21-23
Fruit Growers	Nov. 21-23
Vegetable Growers	Nov. 21-23
Commercial Florists	Nov. 22, 23
4-H Boys	Dec. 26-28

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Welding	Jan. 22-24
Clay Workers	Jan. 22-24
Garden Club	Jan. 28-30
Surveyors	January
Parent Education	Feb. 2, 3
FARM AND HOME WEEK	Feb. 3-8
Dairy Industry Week	Feb. 10-15
Retail Meat Dealers	Feb. 19, 20

Newspapermen	February
Greenkeepers	March 2, 3
Lumber and Material Dealers	March
Soil Management	May 5, 6
High School Agricultural Congress	May 14, 15
Firemen	May 26-29
Livestock Judging Conference	June 17-19
Country Life Institute	June
Seedsmen	June 16
State Instructors Conference of Voc. Ag.	June
4-H Girls	June
Custodians of Public Buildings and Grounds	June
Farm Tours	June and September
Cattle Feeders	August or September
Hatcherymen	October

COMMITTEE IN CHARGE OF SHORT COURSES

D. C. Faber, Director of Engineering Extension, and in charge of Engineering short courses.
E. F. Goss, Associate Professor of Dairy Industry.
P. C. Taff, Assistant Director of Agricultural Extension.
A. L. Bakke, Professor Plant Physiology.
A. B. Caine, Associate Professor of Animal Husbandry.
F. G. Loyd, Assistant Extension Editor.
Henry Giese, Professor of Agricultural Engineering.
Mrs. Zenobia Ness, Chairman of Home Economics Short Course.
A. L. Anderson, Associate Professor of Animal Husbandry.
H. D. Hughes, Professor and Chief of Farm Crops.
R. M. Vifquain, Personnel Officer, Agricultural Division, Chairman.

For information regarding dates, programs, etc., write R. M. Vifquain, Iowa State College, Room 104 Agricultural Hall, Ames, Iowa.

Experiment Stations

AGRICULTURAL EXPERIMENT STATION

R. E. Buchanan, Director

Investigations relating to agriculture were begun practically with the opening of Iowa State Coll e in 1869. The passage of the Hatch Act by the Federal Congress in 1887 led to the prompt acceptance of the provisions by the State of Iowa and the establishment and recognition of the Iowa Agricultural Experimental Station as an integral part of the College. The statement of functions is formulated in the Hatch Act as follows:

"In order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigations and experiment respecting the principles and applications of agricultural science . . . Sec. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals, the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under the varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test the comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States and Territories."

The Federal Adams Act of 1906 increased the funds available for the Experiment Station, at the same time limiting somewhat more narrowly the utilization of the Adams funds, stating that they

"Shall be applied only to paying the necessary expenses of conducting *original researches* or experiments bearing directly on the agricultural industry of the United States."

The federal Purnell Act of 1925 again increased the federal aid available. The statement reads:

"The funds appropriated pursuant to this act shall be applied only to paying the necessary expenses of conducting investigations or making experiments bearing directly on the production, manufacture, preparation, use, distribution and marketing of agricultural products

and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life, and for printing and disseminating the results of said researches."

The most recent act to increase the facilities of the Agricultural Experiment Station is the Bankhead-Jones Act of 1935; this provides: "For research into basic laws and principles relating to agriculture."

The Secretary of Agriculture is also authorized and directed to "encourage research into laws and principles underlying basic problems of agriculture in its broadest aspect; research relating to the improvement of the quality of, and the development of new and improved methods of production of, distribution of, and new and extended uses and markets for, agricultural commodities and by-products and manufactures thereof; and research relating to the conservation, development, and use of land and water resources for agricultural purposes."

The State of Iowa through legislative appropriations has supplemented the federal grants, and has supplied land, buildings and equipment for carrying on the research program adequately.

FUNCTIONS OF THE STATION. It is the definite function of the Iowa Agricultural Experiment Station to utilize all of the facilities and techniques developed by the arts and sciences in the solution of the problems relating primarily to agriculture and rural life. Specifically it must:

1. Increase knowledge concerning the best practices of agriculture in order that the information may be used by the Agricultural Extension Service and other agencies for dissemination to all who may be interested.
2. Increase knowledge basic to the proper teaching of agriculture and the related sciences in schools and colleges.
3. Contribute to the development of fundamental research in agriculture and in the arts and sciences basic to it.

ORGANIZATION. The Iowa Agricultural Experiment Station is organized into three *Offices* having executive or administrative responsibilities relating to all phases of the work of the Station, and fourteen *Sections*, which are entrusted with the research in special fields. The Sections in the Agricultural Experiment Station are analogous to the Departments in the College. In several instances Sections are subdivided into Subsections corresponding to collegiate subdepartments. *Institutes* are composed of the staffs of sections who are working on the various phases of some complex problem. For example, the Iowa Corn Research Institute includes all members of the staff who in a research or executive capacity have to do with corn (maize) investigations. The Offices, Sections, Subsections and Institutes at present recognized are:

A. OFFICES
   1. Office of the Director
   2. Office of the Vice Director
   3. Office of the Bulletin Editor

B. Sections and Subsections

1. Agricultural Engineering Section
2. Agronomy Section
   a. Subsection for Farm Crops
   b. Subsection for Soils
3. Animal Husbandry Section
   a. Subsection for Animal Breeding
   b. Subsection for Animal Chemistry and Nutrition (jointly administered, see also Chemistry Section)
   c. Subsection for Animal Production (Beef Cattle, Horses, Sheep, and Swine)
   d. Subsection for Dairy Husbandry
   e. Subsection for Meats
   f. Subsection for Poultry Husbandry
4. Bacteriology Section
5. Botany and Plant Pathology Section
6. Chemistry Section
   a. Subsection for Animal Chemistry and Nutrition (jointly administered, see also Animal Husbandry Section)
   b. Subsection for Plant Chemistry
7. Dairy Industry Section
8. Entomology and Economic Zoology Section
9. Forestry Section
10. Genetics Section
11. Home Economics Section
    a. Subsection for Foods and Nutrition
    b. Subsection for Household Equipment
    c. Subsection for Textiles and Clothing
12. Horticulture Section
    a. Subsection for Floriculture
    b Subsection for Pomology
    c. Subsection for Vegetable Crops
13. Rural Social Science and Economics Section
    a. Subsection for Agricultural Economics
    b. Subsection for Rural Sociology
    c. Subsection for Rural Education
14. Statistical Section

C. Institutes

1. Iowa Corn Research Institute. For details see special publication of the Iowa Agricultural Experiment Station entitled "Organization of the Iowa Corn Research Institute."

Facilities. Many of the laboratories, greenhouses, etc., for carrying on research in Agriculture and Home Economics are housed in buildings on the main campus of Iowa State College.

The station farms occupy approximately 1170 acres. The principal uses are as follows:

Animal Production Farm. A tract of 180 acres is used for research on nutrition and breeding of swine, sheep, and beef cattle.

DAIRY HUSBANDRY FARM. An experimental barn and laboratory maintained on the 235 acre farm of the Dairy Husbandry Department is used by the Section in studies of feeding and breeding of dairy cows.

POULTRY HUSBANDRY FARM. A tract of about 40 acres is used jointly by the Department and Section of Poultry Husbandry for studies on nutrition and genetics of poultry.

HORTICULTURE FARM. An area of 200 acres is used jointly by the Department and Section of Horticulture for studies on truck crops, fruits and flowers. In addition certain field stations are maintained for special studies in other parts of Iowa. These latter areas are furnished by co-operating groups of farmers.

SOIL EROSION EXPERIMENTAL NURSERY. A ten-acre tract is set aside for the study of the propagation of plants particularly useful in erosion control. In addition there are available for certain purposes the 80 acres of Arboretum and the five acres of Grass and Herbaceous Garden. These acres are used jointly by the Station and the Bureau of Plant Industry, United States Department of Agriculture.

AGRONOMY FARM. This area of 200 acres is used for work on soils, fertilizers, crop rotations, testing of field crops and crop breeding. Many of the studies are in co-operation with the Bureau of Plant Industry, United States Department of Agriculture.

AGRICULTURAL ENGINEERING FARM. This comprises 200 acres devoted to studies on methods of seed bed preparation, cultivation, harvesting and storage of field crops. Much of the work is on corn, in co-operation with the Bureau of Agricultural Engineering, United States Department of Agriculture.

APIARY. An area of ten acres adjoining and merging with the Arboretum is used for studies on bees.

GENETICS AND BOTANY AREAS. A tract of ten acres is used by the Genetics and Botany Sections for studies in plant genetics, plant physiology and plant pathology.

PAGE COUNTY SOIL EROSION FARM. This 200-acre farm is devoted to erosion control studies in co-operation with the Soil Conservation Service, U. S. D. A.

TEMPLETON FARM. Through the co-operation of the Alumni Trustees, the 148 acres of land adjoining the Veterinary and Animal Husbandry Section farms have been purchased. A portion of this tract will be made available for the Agricultural Experiment Station.

WALKER FARM. This farm of 110 acres lying west of the Dairy Farm has been leased and will provide much needed acreage for the Dairy Husbandry Section.

WORK OF STATION. The work of the various sections is organized under specific projects. During the year 1935-36 there are 346 distinct approved projects. The results of these studies are published either as station bulletins, or as articles in the technical and scientific press. Dur-

ing 1934-35 twelve popular bulletins were issued, twelve research bulletins, one annual report, and five miscellaneous publications. Eighty-seven articles were approved for publication in scientific and technical journals.

ENGINEERING EXPERIMENT STATION

T. R. Agg, Director

The Iowa Engineering Experiment Station at Iowa State College was organized in 1904 for the purpose of providing organized research of the character needed to foster and develop the industries of the state.

In the period since its organization the Station has confined itself largely to research projects intended to encourage the utilization of the undeveloped raw materials of the state and to investigations seeking to solve some of the pressing problems relating to sanitation, construction of highways, drainage, purification of industrial wastes, and other like subjects of importance to the health and prosperity of the state.

The primary emphasis has been placed upon types of problems encountered by manufacturing and engineering industries of Iowa, since it is in this particular field that the Station is best qualfied to serve. In addition, a considerable number of researches have been undertaken for the industries related to agriculture with a view to developing solutions to some of the engineering problems that have been encountered.

The growth of the cities and towns of the state and the desire on the part of their citizens for clean, comfortable, and sanitary surroundings have given rise to a number of problems that have puzzled their responsible officials. Some of these relate to the materials and methods employed in pavements, some arise out of the desire to eliminate stream pollution and to dispose of the sewage of the city in an inoffensive manner, and some arise out of the operation of the various utilities such as those furnishing water, gas, and electricity. The Station has made progress in developing the facts and principles needed to solve problems of this type.

The principal lines of research in which the Engineering Experiment Station is engaged are the following:

In the disposal of the waste from some types of industrial establishments there is a problem of sewage disposal for which there has been no satisfactory solution, and several projects are now in progress with a view to developing adequate methods of handling industrial wastes, including that from small creameries and canneries.

Portland cement concrete is used in increasing quantities each year for construction of public works and for privately owned buildings, manufacturing plants, and on the farm. The Station is constantly studying the problem of improving the quality and decreasing the cost of concrete for these various purposes.

Since the organization of the Iowa Highway Commission and the consequent rapid expansion of road improvement, there has been a need for the determination of many economic and engineering facts with refer-

ence to the building of highways. The projects in this field are organized with a view to supplementing the investigations carried on by the Iowa Highway Commission and particularly to developing the fundamental or basic data needed to establish broad principles of control.

Each year many miles of underground conduits are laid. These are used for conveying water, sewage, or gases. There have been a great many failures of sewer pipe due to errors in estimating the loads such pipes would be required to carry. A long series of researches in this field is nearing completion and many questions arising in the design of these conduits will be answered by the results of these investigations.

The necessity for developing a means of utilizing agricultural wastes in order to supplement other efforts to make agriculture profitable has resulted in a long series of researches which have been exceedingly fruitful. Means have been found for manufacturing artificial lumber, paper, and a number of industrial products from soy beans and such waste materials as straw, cornstalks, oat hulls, and the like.

INDUSTRIAL SCIENCE RESEARCH

Charles E. Friley, Director

The Division of Industrial Science, through its scientific staff and in co-operation with other research organizations of the College, sponsors a comprehensive program of research in the natural sciences. The primary purpose of the program is to aid in the solution of the agricultural and industrial problems of Iowa through the application to these problems of the principles, the techniques, and the improved processes worked out in the laboratories of the Departments of Bacteriology, Botany, Chemistry, Geology, Mathematics, Physics, Psychology, and Zoology. The research work is co-ordinated with that of the Agricultural Experiment Station, the Engineering Experiment Station, and the Veterinary Research Institute.

STATISTICAL LABORATORY

George W. Snedecor, Director

The purpose of the Statistical Laboratory is to promote and foster the advantageous use of statistics in the teaching and researches of the College.

RESEARCH. The staff of the Laboratory, together with other interested members of the College staff, seek to develop practical and efficient methods of applying statistical theory to the problems that arise in practice. The results are published in such form as to make them readily available to the layman.

STATISTICAL COUNSEL. Professional advice in statistical methods is made available to students and members of the College staff. This is directed (a) toward the design of experiments whose results shall be capable of

convenient and valid statistical treatment and (b) to the selection of the best available methods for the reduction of data already collected.

TEACHING. While the Statistical Laboratory is not a department of instruction, members of its staff devote part of their time to teaching statistics in the Mathematics Department. Other members of the College staff teach courses in statistics in the Agricultural Economics Department. Still others teach courses whose objectives include specialized application of statistics. One function of the Laboratory is to correlate these activities, to promote interest in statistical scholarship and instruction, to prevent duplication of effort, and to assist in organizing courses in statistics as may be needed in the College.

COMPUTATION SERVICE. The Laboratory furnishes such computation as may be required by persons in the College. This computation may be done in one of the regular computing rooms, or, in special cases, in other convenient locations. The equipment in the Laboratory includes a complete set of machines for sorting and tabulating punched cards.

CALCULATING MACHINES. It is the policy of the College to supply necessary computing machines for all who need them. The Laboratory is responsible for the installation and maintenance of such machines as may be required at various stations in the College buildings. Additional machines are available to those who can arrange to use them in the regular computing rooms.

VETERINARY RESEARCH

C. H. Stange, Director

This department is supported by special appropriation of the legislature and is housed in a laboratory building on the Veterinary Research Farm, one mile south of the campus. In addition to the laboratory, there are buildings especially equipped for housing animals used in experimental work. There are but few animal diseases entirely understood, and many but partially understood. It is the object of this department to investigate such diseases with the view of working out methods by which they can be controlled or eradicated. Thus the work of the department supports the educational work and assists in keeping instruction modern.

Extension

EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS

R. K. Bliss, Director

Extension teaching is recognized as a function of the College, along with resident teaching and research. It was established as a branch of the College by an Act of the Thirty-first General Assembly which became a law on April 10, 1906. Since that time this work has been developed to carry information on every important subject relating to agriculture and rural life from the College to the people.

Extension work is financed jointly by the State of Iowa and the United States Department of Agriculture. Also under a state statute a working relationship is maintained with the county farm bureaus which foster through their programs the same type of educational projects offered by the Extension Service.

In order to accomplish the purposes of the Extension Service a staff of workers representing each department of the Divisions of Agriculture and Home Economics and certain phases of the Divisions of Veterinary Medicine, Industrial Science, and Engineering, is maintained at the College. These workers are available to the people of the state for lectures, demonstrations, consultations, and conferences.

In order to effectively reach the entire state the laws of Iowa provide for an organization of farmers and farm owners in each county now known as the County Farm Bureau. They provide for co-operation between these county farm bureaus, the Iowa State College, and the United States Department of Agriculture. These agencies jointly employ county agents, home demonstration agents, and emergency agents when needed. Educational programs are developed and carried out co-operatively.

The scope of services available to the people of the state is indicated in the following list of projects offered in 1935:

SOILS AND CROPS PROJECTS

Sub-Group: Soils
- Soil Survey Follow-Up Meetings and Demonstrations
- Soil Management to Increase Fertility and Reduce Crop Costs
- Soil Erosion Control

Sub-Group: Farm Crops
- Corn Improvement Demonstrations
- Increasing Legume and Forage Crops
- Small Grain and Flax Improvement
- Pasture Improvement and Renovation

Sub-Group: Horticulture
- Fruit Growing Demonstrations
- Home Gardening and Small Fruit Growing (Including Vegetable, Small Fruits, Grapes and Ornamental Gardening)
- Vegetable Crops Demonstrations

Sub-Group: Forestry
- Shelterbelt Tree Planting Demonstrations
- Erosion Tree Planting Demonstrations
- Reforestation, Woodlot and Woodland Management, Marginal Land Use

Sub-Group: Insect and Rodent Control
- Field Crop Insect Control
- Control of Orchard, Garden, and Truck Crop Insects
- Training School in Household and Garden Insect Control
- Rodent Control Demonstrations
- Livestock Insect Control

Sub-Group: Plant Disease and Botany
- Controlling Field Crop Diseases
- Controlling Fruit and Vegetable Crop Diseases
- Controlling and Eradicating Weeds
- Seed Analysis and Use of Good Seed
- Preservation, Protection, and Appreciation of Plants

LIVESTOCK PROJECTS

Sub-Group: Animal Husbandry
- Swine Growing Demonstrations
- Beef Cattle Demonstrations
- Home Butchering and Use of Meat
- Lamb and Wool Improvement Demonstrations
- Horse Management and Use Demonstrations

Sub-Group: Dairy Husbandry
- Cow Testing Associations
- Feeding the Milking Herd
- Dairy Feeding and Management Short Course
- Dairy Cattle Breeding and Management

Sub-Group: Dairy Industries
- Educational Butter Scoring Contest
- Milk and Cream Scoring
- Dairy Products Judging Demonstrations

Sub-Group: Poultry
- Laying Flock Management Demonstrations
- Growing Healthy Chick Demonstrations
- Flock Breeding Record and Planning Demonstrations
- Turkey Production and Record Demonstrations
- Poultry Institutes with Trade Organizations

Sub-Group: Veterinary
- Animal Health (Livestock Diseases) Meetings and Demonstrations
- Swine Sanitation and Vaccination Schools
- Poultry Sanitation and Tuberculosis Control
- Horse Parasite Control

AGRICULTURAL ECONOMICS PROJECTS

Sub-Group: Farm Management
- Improving Farm Business Management
- Agricultural Economic Conferences

Sub-Group: Marketing
- Marketing Principles School
- Livestock Market Analysis
- Co-operative Livestock Marketing Association Business Administration
- Grain Merchandising Demonstrations
- Business and Organization Analysis of Farmers' Elevators
- Solving Elevator Membership Problems
- Dairy Market Analysis
- Co-operative Creamery Business Administration
- Poultry Marketing Analysis and Business Practices
- Graded Marketing of Eggs and Poultry Demonstrations

Sub-Group: Farm Finance
- Farm Finance
- Farm Debt Conference

Sub-Group: Community Development (Rural Organization)
- Home and Community Recreation Schools
- Program Development for Rural Organizations
- Community Drama Schools
- Community Analysis
- Program Planning—Rural Young People's Groups

FOODS AND NUTRITION PROJECTS

Fundamental Food Needs of the Body
Meals Adapted to Different Ages (Including Child Feeding)
Cutting Costs but Raising Standards
Making Use of Home Grown Products
Better Meals from Common Foods

CLOTHING PROJECTS

Being Well Dressed
Clothing the Family
Personality in the Complete Program

HOME FURNISHING PROJECTS

Fundamental Principles in Home Furnishing
Color and Design in Selection of Furnishings
Home-made Accessories
Thrift in Home Furnishings
Commodity Study of Textiles

HOME MANAGEMENT PROJECTS

How Good Cleaning Practices and Sanitary Measures Contribute to the Successful Home.
How the Well Planned Home Work Shop Creates Leisure Time
How the Business of Homemaking contributes to the Mutual Understanding and Happiness of the Family

CHILD CARE PROJECTS

Growth and Health
Habits and Character
Interests and Education
Youth and Family Relationships

BOYS' AND GIRLS' 4-H CLUB WORK

Livestock Projects
Crops Projects
Miscellaneous Projects
Home Projects

SUPPLEMENTARY PROJECTS

Agricultural Engineering
- Soil Erosion Control Demonstrations
- Farm Structures and Builders' Schools
- Farm Machinery Repair and Management Demonstrations
- Farm Structures and Farm Utilities Demonstrations

Landscape Architecture
- Farmstead Development Demonstrations
- Home Grounds Improvement Training Schools
- Home Grounds Improvement Short Course
- Community Planning Meetings and Demonstrations
- Rural School Ground Improvement

Beekeeping
- Honey Production Demonstrations
- Eradication of Bee Diseases

Agricultural Education

Wildlife Conservation
- Saving Bob-White Quail

Owing to the close relationship with the federal government, the Extension service is given a prominent part in carrying out emergency programs relating to agriculture. To date, the wheat and corn-hog reduction programs have been announced or completed and those dealing with other commodities will be announced. The Extension Service interests itself primarily in the organization and educational phases of these programs.

For definite information regarding services available write Extension Service, Iowa State College.

ENGINEERING EXTENSION

D. C. Faber, Director

The thirty-fifth General Assembly provided an appropriation for the establishing of Engineering Extension work at Iowa State College.

As a department of general extension work, engineering extension is co-ordinate with agricultural extension and bears the same relation to the Division of Engineering that agricultural extension does to the Division of Agriculture. The Engineering Extension has its own instructional force, the members of which are members of the engineering faculty, co-operating closely with the Division of Engineering and the Engineering Experiment Station.

INDUSTRIAL SHORT COURSES

In co-operation with educational, trade, and industrial organizations, Engineering Extension conducts short courses of instruction at the College and at various points throughout the state. These courses vary in length from one day to a week, depending upon the nature of the work. The instruction in these courses is intensely practical and consists of lectures, demonstrations, and laboratory work.

During the past year courses were conducted for telephone operators, custodians and janitors, firemen, welders, gas men, surveyors, and sewage treatment plant operators.

EXTENSION CLASSES AND CORRESPONDENCE STUDY

Extension classes are conducted in industrial centers where a sufficient number of persons are interested in one subject to make such an ar-

rangement possible. These classes meet once or twice a week for a period of two to six months depending upon the length of the course. This work does not duplicate the work of the public night schools in any way. Extension classes are usually given in co-operation with the local Boards of Education or other recognized educational agencies.

Courses in Foremanship are offered in extension classes to groups of foremen and others in executive positions in industry. These courses deal entirely with the problems of the foreman as supervisor, manager, and instructor. The classes may be made up of foremen from a single plant or of foremen in the same industry from different plants.

Industrial Teacher Training courses are offered through extension classes, and by corespondence study.

INDUSTRIAL TEACHER TRAINING

In co-operation with the State Board for Vocational Education this department conducts training courses which are preparatory to teaching trade and industrial subjects.

This work is given through extension classes in cities where there is a sufficient number of men interested in teaching trade and industrial subjects to make such class work a success. For those who are so situated as to have no opportunity for class instruction, certain of these courses are offered by correspondence study.

The following studies may be taken in extension classes or by correspondence study for college credit by those who have had the required preparation for admission to the college.

Voc.Ed. 317—Social Significance of Industrial Education	3 credits
Voc.Ed. 318—Trade Analysis	3 credits
Voc Ed. 408—Foundations of Industrial Education	3 credits
*Phys.Ed. 106—First Aid and Safety	2 credits
*Phys.Ed. 107—Advanced First Aid and Safety	2 credits
*Phys.Ed. 108—Teacher Training in First Aid and Safety	2 credits
Voc.Ed. 510—Technique of Teaching Trades	3 credits

For full description of studies see the respective departments.

VISUAL INSTRUCTION SERVICE

The Visual Instruction service is conducted jointly by Engineering Extension and Agricultural Extension, for the purpose of disseminating information by means of motion pictures, lantern slides, charts, and other visual aids. This material is supplied to civic and commercial clubs, churches, schools, community centers, farm bureaus, and similar organizations.

There are available for distribution 1,200 reels of motion picture film pertaining to agriculture, engineering, trades and industries, home economics, and allied subjects. The slide library contains 250 sets of lan-

*The courses in Phys. Ed are offered only in extension classes.

tern slides (many of them colored) with accompanying lecture notes which may be read or serve as a guide for the lecturer.

In addition to loaning films, slides, and charts, advice and assistance are given in matters pertaining to projectors and projection.

RADIO BROADCASTING

Station WOI is maintained for the purpose of making available to the people of the state those services of the College which are made most effective by means of radio-broadcasting. Accordingly the programs consist of educational material, such as lectures and short courses; information, such as weather reports, crop and market reports; and inspirational and entertainment features, including chapel services, addresses by distinguished visitors, athletic contests, dramatic productions, musical programs, etc.

The programs are prepared under the joint direction of Engineering Extension and Agricultural and Home Economics Extension.

TECHNICAL INFORMATION

Technical Information is made available to the various interests of Iowa through the collection of information, investigations, conferences, lectures, exhibits, bulletins, and answers to inquiries.

Technical information and preliminary engineering advice of a general nature are furnished municipalities, commercial and civic organizations on matters of municipal improvements. A similar service is furnished the industrial interests of the state, and investigations of problems of particular interest to individuals are being made constantly.

It is not the purpose of this department to invade the field of the consulting engineer.

LOAN MATERIAL

To make technical information available for individual study and research this department selects and loans printed matter on engineering and industrial subjects on request. These selections may include books, pamphlets, clippings, blueprint plans, and photographs, the contents in each case being so selected as to best answer the individual requirements of the borrower.

LECTURES

In conection with the Technical Information service, lectures are offered to groups of people on the following subjects: City Planning, Refuse Disposal, Sewage Disposal, Water Supply, Electric Lighting, Street Improvement, Traffic Regulation, Industrial Safety, Smoke and Smoke Prevention, Fuel Conservation, Boiler-room Economy, Rural Electric Service, and Ceramics.

Specialists are available for lectures on other subjects not mentioned above.

These lectures, while on technical subjects, are of such a popular nature that they are readily understood by anyone.

BULLETINS

In order to present technical information of value to those who are not engineers, there are issued from time to time bulletins of special interest to Iowa municipalities, industries, trades, and individuals. These bulletins are the result of investigations, tests, lectures, or papers given during conventions or short courses, or valuable information from other sources. A complete list of bulletins available for distribution will be mailed free on request.

Full particulars concerning any of the work mentioned above will be given on application to the Engineering Extension Service, Iowa State College, Ames, Iowa.

Officers of Instruction*

HUGHES, RAYMOND MOLLYNEAUX, President, 1927.
A.B., Miami University, 1893; M.Sc., Ohio State University, 1897; LL.D., Miami University, 1927; LL.D., Coe College, 1928.

PROFESSORS AND HEADS OF DEPARTMENTS

AGG, T. R., Dean of Engineering, Director of Engineering Experiment Station, 1932, 1913.**
B.S. (E.E.), Iowa State College, 1905; C.E., *ibid.*, 1914.

BAKKE, ARTHUR LAWRENCE, Professor of Plant Physiology, 1925, 1910.
B.S., Iowa State College, 1909; M.S., *ibid.*, 1911; Ph.D., University of Chicago, 1917.

BECKER, ELERY R., Professor of Protozoology, 1934, 1925.
A.B., University of Colorado, 1920; D.Sc., Johns Hopkins, 1923.

BENBROOK, EDWARD ANTONY, Professor and Head of Veterinary Pathology, 1919, 1918.
V.M.D., University of Pennsylvania, 1914.

BERGMAN, HENRY DALE, Professor and Head of Veterinary Physiology and Pharmacology, 1916, 1910.
D.V.M., Iowa State College, 1910

BEVAN, WILLIAM ALFRED, Professor of Mechanical Engineering, 1929, 1909-1912, 1904-1905.
B.S., Iowa State College, 1904; M.S., Massachusetts Institute of Technology, 1921; B.S. (M.E.), Purdue University, 1926.

BLISS, RALPH KENNETH, Director of Agricultural and Home Economics Extension, 1914.
B.S.A., Iowa State College, 1905.

BRANDT, IVA L., Professor of Textiles and Clothing, 1920, 1912.
B.S., Iowa State College, 1905; M.S., Simmons College, 1925.

BROWN, CHARLES HARVEY, Librarian, 1922.
B.A., Wesleyan University, 1897; M.A., *ibid.*, 1899; B.L.S., New York State Library School, 1923.

BROWN, FRANK EMERSON, Professor of Chemistry, 1923, 1917.
A.B., Kansas State Normal School, 1911; S.B., University of Chicago, 1913, Ph.D., *ibid.*, 1918.

BROWN, PERCY EDGAR, Professor and Head of Agronomy, 1932, 1910.
B.Sc., Rutgers College, 1906; A.M., *ibid.*, 1909; Ph.D. *ibid.*, 1912.

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*The General Faculty consists of the President, Deans, Business Manager, Registrar, Personnel Directors, all Professors and Associate Professors, Librarian, Director of Agricultural Extension Work, Director of Engineering Extension Work.

**First date after the name indicates date of appointment to present position; the second date, when the first fails to do so, indicates the date of first appointment in the college.

BUCHANAN, JOHN HALL, Professor of Chemistry, 1930, 1911.
B.S., Iowa State College, 1911; M.S., *ibid.*, 1915.

BUCHANAN, ROBERT EARLE, Dean of Graduate College, Professor and Head of Bacteriology, Director of Agricultural Experiment Station, 1919. 1904.
B.S., Iowa State College 1904; M.S., *ibid.*, 1906; Ph.D., University of Chicago, 1908.

CANNON, CLAWSON Y., Professor of Dairy Husbandry, 1930.
B.S., Utah Agricultural College, 1913; M.S., Iowa State College, 1924, Ph.D., *ibid.*, 1927.

CAUGHEY, ROBERT ANDREW, Professor of Structural Engineering, 1930, 1919.
B.S. (C.E.), Pennsylvania State College, 1907; C.E., *ibid.*, 1916.

CLEGHORN, MARK PERKINS, Professor in Charge of Mechanical Engineering, 1935, 1902.
B.S. (E.E.), Iowa State College, 1902; M.E., *ibid.*, 1907.

CONVERSE, BLAIR, Professor and Head of Technical Journalism, 1927, 1919.
A.B., Earlham College, 1914; M A, University of Wisconsin, 1918.

COOVER, MERVIN S., Professor and Head of Electrical Engineering, 1935.
E.E., Rensselaer Polytechnic Institute, 1914.

COOVER, WINFRED FORREST, Professor and Head of Chemistry, 1913, 1904.
A.B, Otterbein College, 1900; A.M., Ohio State University, 1903; D.Sc, Otterbein College, 1935.

COVAULT, CLARENCE HARTLEY, Professor of Veterinary Medicine, 1929, 1917.
D.V.M., Ohio State University, 1911.

COX, PAUL ERNEST, Professor and Head of Ceramic Engineering, 1926, 1920.
B.S. (Cer), Alfred University, 1905; D.Sc , *ibid.*, 1935.

CRANOR, KATHERINE TAYLOR, Professor of Textiles and Clothing, 1921.
B S., Columbia University, 1914; A.M., *ibid.*, 1918; Diploma Academie de Coupe, Paris, France, 1914.

CUNNINGHAM, JULES C., Special Bibliographer (Library), 1934, 1911.
B.S., Kansas State College, 1905.

CURTISS, CHARLES FRANKLIN, Senior Dean of Agriculture, 1932, 1891.
B S A., Iowa State College, 1887; M.S A., *ibid.*, 1892; D.S. in Agriculture. Michigan Agricultural College, 1907.

DANA, FOREST CHARLES, Professor of General Engineering, 1926, 1923.
B.S. (C.E), University of Washington, 1914; C.E., Iowa State College, 1924.

DAVIDSON, JAY BROWNLEE, Professor and Head of Agricultural Engineering, 1907, 1905.
B.S., M.E., University of Nebraska, 1904; A.E., *ibid.*, 1914; D. Engr., *ibid.*, 1931.

DERBY, J. RAYMOND, Professor and Head of English, 1929, 1914.
A.B., Southwestern College, 1911; A.M., University of Kansas, 1912; Ph.D., Harvard University, 1929.

DEVRIES, LOUIS, Professor and Head of Modern Languages, 1921, 1913.
A.B., Central Wesleyan College, 1907; A.M., Northwestern University, 1908; Ph.D., *ibid.*, 1918.

DIETZ, S. M., Professor of Plant Pathology, 1934, 1925.
B.S., Iowa State College, 1917; M.S., *ibid.*, 1918; Ph.D., *ibid.*, 1924.

DODDS, JOHN S., Professor of Civil Engineering, 1934, 1912.
B.S. (C.E.), Iowa State College, 1912; C.E., *ibid.*, 1917.

DRAKE, CARL JOHN, Professor and Head of Zoology and Entomology, 1922.
B.Sc., B.Ped., Baldwin-Wallace College, 1912; M.A., Ohio State University, 1914; Ph.D., *ibid.*, 1921.

EDWARDS, JAMES FRANKLIN, Professor and Head of Hygiene, 1921.
A.B., Grove City College, 1894; A.M., *ibid.*, 1896; M.D., University of Pennsylvania, 1898.

ELWOOD, PHILLIP HOMER, JR., Professor and Head of Landscape Architecture, 1923.
B.S.A., Cornell University, 1910.

ERWIN, A. T., Professor of Horticulture, 1913, 1902.
B.S., University of Arkansas, 1900; M S., Iowa State College, 1902.

EVANS, JOHN ELLIS, Professor and Head of Psychology, 1922, 1921.
A.B., Indiana University, 1910; M.A., *ibid.*, 1911; Ph.D., Columbia University, 1916.

FABER, DANIEL C., Director of Engineering Extension, 1918, 1914.
B.S., University of Illinois, 1908; E.E., *ibid.*, 1911.

FISH, FRED ALAN, Professor of Electrical Engineering, 1907, 1905.
M.E. (E.E.), Ohio State University, 1898.

FISHER, GENEVIEVE, Dean of Home Economics, 1927, 1914.
B.S , Columbia University, 1914; A.M., *ibid.*, 1927.

FOX, GERALD WILLIS, Professor of Physics, 1934, 1930.
A.B., University of Michigan, 1923; A.M., *ibid.*, 1925; Ph.D., *ibid.*, 1926.

FOUST, HARRY LEWIS, Professor and Head of Veterinary Anatomy, 1927.
D.V.M., Ohio State University, 1914.

FOWLER, GEORGE R., Professor and Head of Veterinary Surgery, 1932, 1928.
B S., Washington State College, 1925; D.V.M., *ibid.*, 1925.

FRILEY, CHARLES EDWIN, Vice President, Dean of Industrial Science, 1935, 1932.
B.S., Agricultural and Mechanical College of Texas, 1919; A.M., Columbia University, 1923; LL.D., Simmons University, 1929.

FULLER, ALMON HOMER, Professor and Head of Civil Engineering, 1920.
C.E., Lafayette College, 1897; M.S., *ibid.*, 1900; M.C.E., Cornell University, 1898.

FULLER, GEORGE MILTON, Professor of Economics, 1924, 1920.
A.B., University of Wisconsin, 1917; M B.A., University of Southern California, 1928.

FULMER, ELLIS INGHAM, Professor of Chemistry, 1923, 1919.
B.A., Nebraska Wesleyan University, 1912; M.A., University of Nebraska, 1913; Ph.D., University of Toronto, 1919.

GIESE, HENRY, Professor of Agricultural Engineering, 1930, 1914.
B.S. (Arch. E.), Iowa State College, 1919; M.S. (A.E.), *ibid.*, 1927; Arch. E., *ibid.*, 1930.

GILKEY, HERBERT JAMES, Professor and Head of Theoretical and Applied Mechanics, 1931.
B.S. (C.E.), Oregon State College, 1911; S.B. (C.E.), Massachusetts Institute of Technology, 1916; B.S. (C.E.), Harvard University, 1916; M.S. (T.&A.M.), University of Illinois, 1923.

GILMAN, HENRY, Professor of Chemistry, 1923, 1919.
B.S., Harvard University, 1915; M.S., *ibid.*, 1917; Ph.D., *ibid.*, 1918.

GILMAN, JOSEPH C., Professor of Botany, 1934, 1918.
B.S., University of Wisconsin, 1912; M.S., *ibid.*, 1914; Ph.D., Washington University 1915.

GLEISER, FERN WILLARD, Professor and Head of Institution Management, 1931, B.S., University of Washington, 1924; M.S., Columbia University, 1930.

GREENE, GUY SHEPARD, Professor and Head of Public Speaking, 1930.
A.B., Hobart College, 1920; Ph.D. Cornell University, 1926.

GREGG, HUGH CARLETON, Business Manager and Secretary, 1933.
Ph.B., University of Chicago, 1921; A.M., *ibid.*, 1923.

HAMMER, BERNARD WERNICK, Professor of Dairy Bacteriology, 1916, 1911.
B.S.A., University of Wisconsin, 1908; Ph.D., University of Chicago, 1920.

HANSEN, JOANNE M., Professor and Head of Applied Art, 1920, 1915.
Diploma, Pratt Institute; B.A., Iowa State Teachers College, 1917; Certificate, Supervisor of Art, Columbia University, 1924; M. A., *ibid.*, 1924.

HELSER, MAURICE D., Dean of Junior College and Director of Personnel for Men, 1933, 1915.
B.S.A., Ohio State University, 1914; M.S., Iowa State College, 1916.

HENDERSON, EARL WILTON, Professor of Poultry Husbandry, 1930.
B.S.A., University of Missouri, 1921; A.M., *ibid.*, 1924; Ph D., University of Illinois, 1930.

HIXON, RALPH MALCOLM, Professor of Chemistry, 1929, 1923.
B.S., Iowa State College, 1917; Ph.D., University of Wisconsin, 1921.

HOLL, DIO LEWIS, Professor of Mathematics, 1934, 1925.
A.B., Manchester College, 1917; A.M., Ohio State University, 1920; Ph.D., University of Chicago, 1925

HORN, NELSON PAXSON, Director of Religious Life, Professor and Head of Religious Education, 1929.
A B., Missouri Wesleyan College, 1916; B.D , Garrett Biblical Institute, 1918; M.A., Northwestern University, 1919.

HOYT, ELIZABETH ELLIS, Professor of Economics and Home Management, 1927, 1925.
A.B., Boston University, 1913; A.M., Radcliffe College, 1924; Ph.D., *ibid.*, 1925.

HUGHES, HAROLD DE MOTT, Professor of Farm Crops, 1910.
B.S., University of Illinois, 1907; M.S.A., University of Missouri, 1908.

HUNTER, WILLIAM L., Professor and Head of Industrial Arts, 1931, 1927,
B.A., Iowa State Teachers College, 1919; M.A., Columbia University, 1926.

IVERSON, CAROLD A., Professor of Dairy Industry, 1930, 1916.
B.S. (Dairying), South Dakota State College, 1915; M.S., Iowa State College, 1917.

JONES, W. PAUL, Professor of English, 1932, 1931.
A.B., Wabash College, 1913; Ph.D., Cornell University, 1925.

KEREKES, FRANK, Professor of Civil Engineering, 1931, 1920.
B.S., College of the City of New York, 1917; C.E., Columbia University, 1920.

KILDEE, HENRY HERBERT, Dean of Agriculture, 1933, 1908.
B.S.A., Iowa State College, 1908; M.S., *ibid.*, 1917.

KIMBALL, ALLEN HOLMES, Professor and Head of Architectural Engineering, 1915, 1914.
B.L. (Arch.), University of California, 1910; B.S. (Arch.), Massachusetts Institute of Technology, 1911; M.S. (Arch.), *ibid.*, 1912.

KNIGHT, HARRY H., Professor of Entomology, 1934, 1924.
B.S., Cornell University, 1914; Ph.D., *ibid.*, 1920.

LAGRANGE, WILLIAM F., Professor of Animal Husbandry, 1920, 1917.
B.S., Iowa State College, 1917; M.S., *ibid.*, 1920.

LANCELOT, WILLIAM H., Professor and Head of Vocational Education, Director of Teacher Training, 1923, 1918.
B.S., Iowa State College, 1919; D.Ed., Miami University, 1932.

LEVINE, MAX, Professor in Charge of Bacteriology, 1933, 1913.
S.B., Massachusetts Institute of Technology, 1912; Ph.D., State University of Iowa, 1922.

LINDSTROM, ERNEST W., Professor and Head of Genetics, 1922.
A.B., University of Wisconsin, 1914; Ph.D., Cornell University, 1917.

LONSDALE, JOHN TIPTON, Professor and Head of Geology, 1935.
A.B., University of Iowa, 1917; M.S., *ibid.*, 1921; Ph.D., University of Virginia, 1924.

LUSH, JAY LAURENCE, Professor of Animal Husbandry, 1930.
B.S., Kansas State Agricultural College, 1916; M.S., *ibid.*, 1918; Ph.D., University of Wisconsin, 1922.

MACDONALD, GILMOUR BEYERS, Professor of Forestry, 1913, 1910.
B.S.F., University of Nebraska, 1907; M.F., *ibid.*, 1914.

MACRAE, TOLBERT, Professor and Head of Music, 1921, 1920.

MARSTON ANSON, Senior Dean of Engineering, Research Engineer Experiment Station, 1932, 1892.
C.E., Cornell University, 1889; D. Engr., University of Nebraska, 1925; D. Engr., Michigan State College, 1927.

MARTIN, JOHN NATHAN, Professor of Plant Morphology and Cytology, 1917, 1911,
A.B., Indiana University, 1907; Ph.D., University of Chicago, 1913.

MCKELVEY, JOSEPH VANCE, Professor of Mathematics, 1934, 1919.
A.B., Cornell University, 1906; Ph.D., *ibid.*, 1909.

MEEKER, WARREN H., Professor of Mechanical Engineering, 1907, 1891.
M.E., Cornell University, 1891.

MELHUS, IRVING E., Professor and Head of Botany, 1930, 1916.
B.Sc., Iowa State College, 1906; Ph.D., University of Wisconsin, 1912.

MILLER, CORA B., Professor and Head of Home Economics Education, 1928, 1916.
B.S., Beloit College, 1899; Diploma, Bradley Polytechnic Institute, 1909; M.A., University of Chicago, 1924.

MORTENSEN, MARTIN, Professor and Head of Dairy Industry, 1909.
B.S.A., Iowa State College, 1909; LL.D., Kansas State College, 1934.

MURRAY, CHARLES, Professor of Veterinary Research, and of Veterinary Hygiene, 1917, 1908.
Pe.B., Drake University, 1906; B.S., Iowa State College, 1910; D.V.M., *ibid.*, 1912.

NELSON, P. MABEL, Professor and Head of Foods and Nutrition, 1926, 1923.
B.S., University of California, 1915; M.A., *ibid.*, 1916; Ph.D., Yale University, 1923.

NELSON, VICTOR EMANUEL, Professor of Chemistry, 1923, 1919.
B.S., University of Wisconsin, 1912; M.S., *ibid.*, 1914

NOBLE, ALVIN BUELL, Professor of English, 1898.
B.Ph., State University of Iowa, 1887.

NORMAN, ROY A., Professor of Mechanical Engineering, 1921, 1907.
B.M.E., Iowa State College, 1903; M.E., *ibid.*, 1909.

ODELL, HERBERT R., Professor and Head of Military Science and Tactics, 1934.
U. S. Military Academy, 1910; Mounted Service School, 1915; Field Artillery School, 1920; Command and General Staff School, 1924; Lieut. Col., F. A.

PAINE, FRANK D., Professor and Head of General Engineering, 1929, 1912.
B.S. (E.E.), Iowa State College, 1909.

PEET, LOUISE JENISON, Professor and Head of Household Equipment, 1931, 1928,
B.A., Wellesley College, 1908; M.A., *ibid.*, 1911; Ph.D., Iowa State College, 1929.

PICKETT, BETHEL STEWART, Professor and Head of Horticulture and Forestry, 1923.
B.S.A., Toronto University, 1904; M S., University of Illinois, 1906.

RATHBONE, ROSALIE VIRGINIA, Professor and Head of Textiles and Clothing, 1931.
B.S., Teachers College, Columbia University, 1918; M.A., *ibid.*, 1928.

RAYMOND, WILLIAM RANDOLPH, Professor of English, 1921, 1907.
A.B., Grinnell College, 1894.

RICHARDSON, CHARLES HOWARD, Professor of Entomology, 1931, 1928.
A.B., Stanford University, 1912; M.S., Harvard University, 1913; Ph D., Columbia University, 1921.

RICHEY, HARRY WYATT, Professor of Pomology, 1921, 1914.
B.Sc.A., University of Nebraska, 1914.

ROBERTS, MARIA M., Professor of Mathematics, Senior Dean of Junior College, 1933, 1891.
B.L., Iowa State College, 1890.

SAGE, JAMES R., Registrar, Vice Dean of Junior College, 1920, 1915.
B.A., Ohio State University, 1912; M.S., Rose Polytechnic Institute, 1915.

SCHMIDT, LOUIS BERNARD, Professor and Head of History and Government, 1930, 1906.
Ph.B., Cornell College, 1901; A.M., *ibid.*, 1906; Litt.D., *ibid.*, 1934.

SCHULTZ, THEODORE WILLIAM, Professor and Head of Economics and Sociology, 1935, 1930.
B.S., South Dakota State College, 1927; M.S., University of Wisconsin, 1928; Ph.D., *ibid.*, 1930.

SHATTUCK, FREDRICA VAN TRICE, Professor of Public Speaking, 1916, 1907.
B.A., University of Wisconsin, 1905.

SHEARER, PHINEAS STEVENS, Professor and Head of Animal Husbandry, 1935, 1912.
B.S., Iowa State College, 1912; M.S., *ibid.*, 1928.

SIMS, FRANCES A., Director of Personnel for Women, Professor of Textiles and Clothing, 1930, 1925.
Ph.B., University of Chicago, 1919; M.S., Simmons College, 1924.

SMITH, EDWIN RAYMOND, Professor and Head of Mathematics, 1921,
A.B., University of Illinois, 1905; A.M., University of Wisconsin, 1908; Ph.D., University of Munich, 1911.

SMITH, MRS. FLORENCE BUSSE, Professor and Acting Head of Home Management, 1934, 1915-1926.
A.B., Northwestern University, 1908; M.A., Columbia University, 1918.

SNEDECOR, GEORGE WADDEL, Professor of Mathematics, 1930, 1913.
B.S., University of Alabama, 1905; M.A., University of Michigan, 1912.

SPINNEY, LOUIS BEVIER, Professor of Physics, 1897, 1891.
B.M.E., Iowa State College, 1892; B.S., (E.E.), *ibid.*, 1893.

STANGE, CHARLES HENRY, Dean of Veterinary Medicine, Professor and Head of Veterinary Hygiene, 1909, 1907.
D.V.M., Iowa State College, 1907.

STEVENSON, WILLIAM HENRY, Professor of Soils, Vice Director of Agricultural Experiment Station, 1903, 1902.
A.B., Illinois College, 1893; B.S.A., Iowa State College, 1905; D.Sc., Illinois College, 1923.

SWEENEY, ORLAND RUSSELL, Professor and Head of Chemical and Mining Engineering, 1920.
Sc.B. (Chem. E.), Ohio State University, 1909; M.A., *ibid.*, 1910; Ph.D., University of Pennsylvania, 1916; Ch.E., Ohio State University, 1935.

THOMAS, BYRON HENRY, Professor of Animal Chemistry and Nutrition, 1931.
B.S., University of California, 1922; M.S., University of Wisconsin, 1924; Ph.D., *ibid.*, 1929.

TILDEN, WINIFRED R., Professor and Head of Physical Education, 1919, 1904
B.A., Mt. Holyoke, 1903.

VANCE, THOMAS FRANKLIN, Professor of Psychology and of Child Development, 1927, 1914.
A.B., Coe College, 1909; M.A., University of Iowa, 1911; Ph.D., *ibid.*, 1913.

VEENKER, GEORGE F., Professor and Head of Physical Education, 1933, 1931.
A.B., Hope College, 1916.

VOLZ, EMIL CONRAD, Professor of Horticulture 1928, 1914.
B.S., Michigan Agricultural College, 1914; M.S.A., Cornell University, 1918.

VON TUNGELN, GEORGE HENRY, Professor of Sociology, 1919, 1913.
Ph.B., Central Wesleyan College, 1909; M.A., Northwestern University, 1910; Ph.D., Harvard University, 1926.

WALSH, FRANK EDWARD, Professor and Head of Veterinary Obstetrics, 1931, 1919.
D.V.M., Iowa State College, 1918.

WELLHOUSE, WALTER H., Professor of Entomology, 1934, 1921.
B.A., University of Kansas, 1913; M.A., *ibid.*, 1917; Ph.D., Cornell University, 1920.

WERKMAN, CHESTER HAMLIN, Professor of Bacteriology, 1933, 1921.
B.S., Purdue University, 1919; Ph.D., Iowa State College, 1923.

WILKINSON, JOHN ANDERSON, Professor of Chemistry, 1919, 1913.
B.Sc., Ohio State University, 1903; Ph.D., Cornell University, 1909.

WOODROW, JAY WALTER, Professor and Head of Physics, 1930, 1921.
B.A., Drake University, 1907; B.A., Oxford University (England), 1910; Ph.D., Yale University, 1913; LL.D., Drake University, 1931.

ASSOCIATE PROFESSORS

AIKMAN, JOHN M., Associate Professor of Botany, 1930, 1927.
A.B., Nebraska Wesleyan University, 1917; A.M., *ibid.*, 1921; Ph.D., University of Nebraska, 1928.

ALLBAUGH, LELAND G., Associate Professor of Agricultural Economics, 1935, 1918.
B.S., Iowa State College, 1919; M.S., *ibid.*, 1928.

ALLEN, EDWARD SWITZER, Associate Professor of Mathematics, 1921.
A.B., Harvard University, 1909; A.M., *ibid.*, 1910; Ph.D., *ibid.*, 1914.

ANDERSON, ARTHUR LAWRENCE, Associate Professor of Animal Husbandry, 1922, 1920.
B.S., University of Minnesota, 1916; M.S., Iowa State College, 1922.

AYRES, QUINCY CLAUDE, Associate Professor of Agricultural Engineering, 1921, 1920.
B.S., University of Mississippi, 1912; B.E., *ibid.*, 1912; C.E., *ibid.*, 1920.

BENEDICT, LERAY DOIG, Associate Professor of Economics, 1927, 1925.
A.B., University of Michigan, 1915; M.A., *ibid.*, 1925.

BOWERS, CHARLES F., Architectural Engineering, 1934, 1928.
B.S., North Dakota Agricultural College, 1928; M.Arch., Carnegie Institute, 1935.

BRASHEAR, VIVIAN J., Associate Professor of Household Equipment, 1929, 1917.
B.S., Iowa State College, 1917; M.S., *ibid.*, 1928.

BROWN, LYNN T, Associate Professor of Mechanical Engineering, 1930, 1927.
B.S., Iowa State College, 1926.

CAINE, ALFRED B., Associate Professor of Animal Husbandry, 1919, 1916.
B.S., Utah Agricultural College, 1914; M.S., Iowa State College, 1917.

CARR, PERCY HAMILTON, Associate Professor of Physics, 1932, 1930.
B.S., Furman University, 1925; M.S., University of North Carolina, 1926, Ph.D., Cornell University, 1930.

CLARK, NORMAN ASHWELL, Associate Professor of Chemistry, 1927, 1921.
B.S.A., University of Alberta, 1918; M.A., University of Toronto, 1919; Ph.D., *ibid.*, 1921.

COLPITTS, JULIA TRUEMAN, Associate Professor of Mathematics, 1913, 1900.
A.B., Mount Allison University, Canada, 1899; A.M., Cornell University, 1900; Ph.D., *ibid.*, 1924.

COOK, HERBERT CLARE, Associate Professor of Government, 1930, 1928.
B.A., Iowa State Teachers College, 1922; M.A., State University of Iowa, 1925; Ph.D., *ibid.*, 1926.

COOPER, ESTHER L., Associate Professor of English, 1916, 1909.
Ph.B., State University of Iowa, 1903; M.A., University of Chicago, 1925.

DAASCH, HARRY LAWRENCE, Associate Professor of Mechanical Engineering, 1935, 1929.
B.S., Iowa State College, 1925; E. Met., Colorado School of Mines, 1927; M.E., Iowa State College, 1930; M.S., *ibid.*, 1933.

DICKERSON, IRA WILMER, Acting Associate Professor of Agricultural Engineering, 1935.
B.S. (E.E.), University of Illinois, 1909.

DUNAGAN, WALTER MATHEW, Associate Professor of Theoretical and Applied Mechanics, 1933, 1924.
A.B., Simpson College, 1919; B.S., Iowa State College, 1923; C.E., *ibid.*, 1928; M.S., *ibid.*, 1930.

DUNBAR, RALPH M., Assistant Librarian, 1925, 1924.
B.A., George Washington University, 1912; M.A., Columbia University, 1914.

EDGAR, RACHEL HARTMAN, Associate Professor of Chemistry, 1928, 1924.
B.A., Ohio State University, 1917; B.S., *ibid.*, 1918; M.S., *ibid.*, 1920; Ph.D., *ibid.*, 1925.

FIRKINS, BRUCE JUDSON, Associate Professor of Soils, 1926, 1918.
B.S., Iowa State College, 1917; M S., *ibid.*, 1918.

FISHER, MABEL C., Associate Professor of Applied Art, 1925, 1923.
Diploma, Pratt Institute, 1923.

FOSTER, JOHN ELDEN, Dean of the Summer Quarter, Associate Professor of Vocational Education, 1922.
B.A., Western College, 1897; B.A., Yale University, 1898.

FRIANT, REGINA JOSEPHINE, Associate Professor of Home Economics Education, 1925, 1923.
Ph.B., University of Chicago, 1916; M.A., *ibid.*, 1922.

FRITZ, MARTIN FREDERICK, Associate Professor of Psychology, 1932, 1927.
B.S., Kansas State College, 1924; M.S., *ibid.*, 1925; Ph.D., University of Chicago, 1931.

GASKILL, HAROLD VINCENT, Associate Professor of Psychology, 1931, 1930.
B.A., Ohio State University, 1926; M.A., *ibid.*, 1927; Ph.D., *ibid.*, 1930.

GENAUX, CHARLES MURRAY, Associate Professor of Forestry, 1935.
B.S. (For.), Pennsylvania State Forest School, 1924; M.S. (For.), University of Idaho, 1929.

GOSS, E. F., Associate Professor of Dairy Industry, 1919.
B S. (Dairying), Iowa State College, 1915; M S., *ibid.*, 1916.

GOUWENS, CORNELIUS, Associate Professor of Mathematics, 1926, 1920.
B.S., Northwestern University, 1910; A M., University of Illinois, 1911; Ph.D , University of Chicago, 1924.

GWYNNE, CHARLES SUMNER, Associate Professor of Geology, 1931, 1927.
A.B., Cornell University, 1907; M S , Syracuse University, 1925; Ph.D., Cornell University, 1927.

HAMLIN, HERBERT M., Associate Professor of Vocational Education 1923, 1920.
B S., Iowa State College, 1916; M S , *ibid* , 1922; Ph D., University of Chicago, 1931.

HANSEN, ELMER NEIL, Associate Professor of Dairy Husbandry, 1929.
B Sc., University of Minnesota, 1923; M S , Iowa State College, 1925.

HARRIS, HALBERT M., Associate Professor of Zoology and Entomology, 1935, 1923.
B S , Mississippi Agricultural and Mechanical College, 1923; M S , Iowa State College, 1925; Ph D., *ibid.*, 1928

*HARTER, WILLIAM LEWIS, Associate Professor of Sociology, 1919, 1917.
A.B., McPherson College, Kansas, 1904; M.S., Iowa State College, 1918.

HAWLEY, OSCAR HATCH, Associate Professor of Music, 1926, 1920.

HAYNES, LOYAL M., Associate Professor of Military Science and Tactics, 1935.
B S., Knox College, 1926; Graduate, Field Artillery School, 1922; Major, F.A.

*HENSON, EDWIN RAY, Associate Professor of Farm Crops, 1931, 1921.
B.S., Oklahoma Agricultural and Mechanical College, 1920, M S , Iowa State College, 1922; Ph.D., *ibid.*, 1931.

HERR, GERTRUDE A., Associate Professor of Mathematics, 1924, 1913.
B.S., Iowa State College, 1907; M.S , *ibid.*, 1917.

*Absent on leave.

HEWITT, EARL ALBON, Associate Professor of Veterinary Physiology, 1929, 1915.
A.B., Des Moines College, 1914; B.S., Iowa State College, 1915; D.V.M., *ibid.*, 1918; M.S., University of Minnesota, 1929; Ph.D., *ibid.*, 1931.

HILL, HARRY W., Associate Professor of Millitary Science and Tactics, 1932.
Graduate, Engineer School Company, Officers' Course, 1925; B.S., Cornell University, 1913; Major, Corps of Engineers.

HOGREFE, PEARL, Associate Professor of English, 1931.
A.B., Southwestern College, 1910; A.M., University of Kansas, 1913; Ph.D., University of Chicago, 1927.

HOPKINS, JOHN ABEL, JR., Associate Professor of Agricultural Economics, 1925, 1921.
B.S., Delaware, 1917; M.A., Harvard University, 1921; Ph.D., *ibid.*, 1924.

HUMMEL, JESSE GREENVILLE, Associate Professor of Mechanical Engineering, 1910, 1902.
B.M.E., Iowa State College, 1902; M.E., *ibid.*, 1914.

JENNINGS, WILLIAM HARNEY, Associate Professor of Chemistry, 1931, 1923.
B.S., North Carolina State College, 1923; Ph.D., Iowa State College, 1927.

KUNERTH, WILLIAM, Associate Professor of Physics, 1916, 1907.
A.B., University of Wisconsin, 1904; M.A., *ibid.*, 1910; Ph.D., University of Chicago, 1921.

LANGE, PAULUS, Associate Professor of English, 1932, 1920.
A.B., Augustana College, 1918; M.A., University of Illinois, 1920.

LAUER, ALVIH R., Associate Professor of Psychology, 1930, 1925.
B.A., McPherson College, 1922; M.A., University of Iowa, 1925; M.S., Iowa State College, 1928; Ph.D., Ohio State University, 1929.

LOOMIS, WALTER E., Associate Professor of Botany, 1927.
B.S., University of Illinois, 1921; M.S., Cornell University, 1922; Ph.D., *ibid.*, 1924.

LORCH, FRED WILLIAM, Associate Professor of English, 1932, 1921.
A.B., Knox College, 1918; M.A., University of Iowa, 1928.

LOWE, BELLE, Associate Professor of Foods and Nutrition, 1921, 1918.
Ph.B., University of Chicago, 1917; M.S., *ibid.*, 1934.

LUCAS, ALFRED MARTIN, Associate Professor of Zoology and Entomology, 1935.
A.B., Wabash College, 1924; Ph.D., Washington University, 1929.

MAJOR, CHARLES CURTIS, Associate Professor of Mechanical Engineering, 1908.
M.E., Bloomsburg State Normal School, Pa., 1891; M.E., Cornell University, 1898.

MCCLAIN, FRED H., Associate Professor of Electrical Engineering, 1919.
B.S. (E.E.), University of Illinois, 1910.

*MCKIBBEN, EUGENE GEORGE, Associate Professor of Agricultural Engineering, 1928.
B.S., Iowa State College, 1922; M.S. (A.E.), University of California, 1927.

MENZE, LOUIS EDMOND, Associate Professor of Physical Education, 1931, 1928.
B.S., Missouri State Teachers College, 1923.

MERCHANT, IVAL ARTHUR, Associate Professor of Veterinary Hygiene, 1934, 1925.
D.V.M., Colorado State College, 1924; M.S., Iowa State College, 1928; Ph.D., *ibid.*, 1933; C.P.H., Yale University, 1934.

MOODY, V. ALTON, Associate Professor of History, 1930, 1925.
A.B., Meridan College, 1912; M.A., Tulane University, 1913; Ph.D., University of Michigan, 1923.

MORGAN, BARTON, Associate Professor of Vocational Education, 1929, 1923.
B.S., Missouri State Teachers College, 1919; M.S., Iowa State College, 1922; Ph.D., State University of Iowa, 1934.

MOULTON, DONALD ALONZO, Associate Professor of Ceramic Engineering, 1929, 1921.
Cer.E., Ohio State University, 1908.

MOYER, RALPH ALTON, Associate Professor of Civil Engineering, 1933, 1921.
B.S., (C.E.), Lafayette College, 1920; M.S., Iowa State College, 1925; C.E., *ibid*, 1934.

*MURRAY, WILLIAM GORDON, Associate Professor of Agricultural Economics, 1931, 1925.
B.A., Coe College, 1924; M.A., Harvard University, 1925; Ph.D., University of Minnesota, 1932.

NAYLOR, NELLIE MAY, Associate Professor of Chemistry, 1928, 1909.
B.A., State University of Iowa, 1908; M.S., Iowa State College, 1918; Ph.D., Columbia University, 1923.

NICHOLS, HARRY E., Associate Professor of Horticulture, 1935, 1918.
B.S., Iowa State College, 1917; M.S., *ibid.*, 1930.

O'BRYAN, EDNA, Associate Professor of Applied Art, 1935, 1925.
Graduate of Pratt Institute, 1918, B.S., Central Missouri State Teachers College, 1930.

OHLSON, MARGARET ALEXANDER, Associate Professor of Foods and Nutrition, 1935.
B.A., Washington State College, 1923; M.S., State University of Iowa, 1930; Ph.D., *ibid.*, 1934.

OLSON, OSCAR ANTON, Associate Professor of Mechanical Engineering and in Charge of Engineering Drawing, 1935, 1913.
B.M.E., Iowa State College, 1908; M.E., *ibid.*, 1914.

OTOPALIK, HUGO, Associate Professor of Physical Education, 1931, 1920.
A.B., University of Nebraska, 1918.

PARK, O. WALLACE, Associate Professor of Apiculture, 1925, 1918.
B.S., Kansas State College, 1917; M.S., Iowa State College, 1920; Ph.D., *ibid.*, 1924.

PLAGGE, HERBERT JOHN, Associate Professor of Physics, 1918, 1909.
B.S., Northwestern University, 1906; M.A., University of Wisconsin, 1910

PORTER, R. HOWARD, Associate Professor of Botany and Agronomy, 1931, 1919.
B.S., Iowa State College, 1918; M.S., *ibid.*, 1920; Ph.D., *ibid.*, 1930.

ROBINSON, PIERRE G., Associate Professor of Mathematics, 1930, 1922.
B.S., University of Chicago, 1914; M.S., *ibid.*, 1922; Ph.D., *ibid.*, 1925.

ROSS, EARLE DUDLEY, Associate Professor of History, 1923.
Ph.B., Syracuse University, 1909; Ph.M., *ibid.*, 1910; A.M., Cornell University, 1912; Ph.D., *ibid.*, 1915.

ROUDEBUSH, ROY E., Associate Professor of Mechanical Engineering, 1925, 1909-1912.
A.B., Indiana University, 1903; M.E., Cornell University, 1907.

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*Absent on leave.

RUNNELLS, RUSSELL ALGER, Associate Professor of Veterinary Pathology, 1930.
D.V.M., Michigan State College, 1916; M.S., University of Michigan, 1930.

RUTHERFORD, GEDDES WILLIAM, Associate Professor of Government, 1925.
A.B., University of Missouri, 1913; A.M., Harvard University, 1916.

SETTLES, O., Associate Professor of Textiles and Clothing, 1924, 1923.
B.S., Columbia University, 1920.

SEXAUER, THEODORE E., Associate Professor of Vocational Education, 1929, 1928.
B.S. (Agr.), Iowa State College, 1909; B,S., (Ag.Ed.), M.S., *ibid.*, 1918; M.A., Columbia University, 1926; Ph.D., Cornell University, 1928.

SHARP, MARLAY A., Associate Professor of Agricultural Engineering, 1931, 1925.
B.S., University of Nebraska, 1915; M.S., Iowa State College, 1928.

SIMPSON, ROBERT I., Associate Professor of Physical Education, 1931, 1926.
B.S., University of Missouri, 1917.

SHEPHERD, GEOFFREY SEDDON, Associate Professor of Agricultural Economics, 1935, 1925.
B.S.A., University of Saskatchewan, 1924; M.S., Iowa State College, 1925; Ph.D., Harvard University, 1932.

SMITH, ERMA, Associate Professor of Physiology, 1927, 1926.
A.B., University of Kansas, 1920; M.A., Vassar College, 1922; Ph.D., University of Chicago, 1926; M.D., Rush Medical College, 1933.

SMITH, FREDERICK BUREAN, Associate Professor of Soils, 1932, 1922.
B.S., University of Georgia, 1922; M.S., Iowa State College, 1923; Ph.D., *ibid.*, 1926.

STARBUCK, ARWARD, Associate Professor of English, 1924, 1913.
A.B., University of Arkansas, 1908; A.M., University of Chicago, 1922.

STARRAK, JAMES ABEL, Associate Professor of Vocational Education, 1926, 1920.
B.S., Iowa State College, 1921; M.S., *ibid.*, 1922; Ph.D., Boston University, 1932.

STEPHENS, MARIE, Associate Professor of Textiles and Clothing, 1926, 1920.
B.S. (H.Ec.), Iowa State College, 1911.

STEWART, LOWELL O., Personnel Officer of Engineering Division, 1935, 1924.
B.S. (C.E.), Michigan State College, 1917; M.S., Iowa State College, 1927; C.E., *ibid.*, 1928.

STILES, HAROLD, Associate Professor of Physics, 1915, 1914.
Ph.B., Kenyon College, 1896; A.M., Harvard University, 1904; Ph.D., Northwestern University, 1909.

SWANSON, LYDIA VICTORIA, Associate Professor and Acting Head of Child Development, 1935, 1924.
B.Sc., University of Nebraska, 1923; M.S., Iowa State College, 1931.

SWANSON, PEARL P., Associate Professor of Foods and Nutrition, 1930.
B.S., Carleton College, 1916; M.S., University of Minnesota, 1924; Ph.D., Yale University, 1930.

THOMSON, ROY BERTRAND, Associate Professor of Forestry, 1934.
B.S., University of Minnesota, 1925; M.F., Yale University, 1928.

TOMPKINS, DORA GILBERT, Associate Professor of English, 1919, 1905.
A.B , Monmouth College, 1893; A.M., University of Chicago, 1921.

*TURNER, JOHN SIDNEY, Associate Professor of Mathematics, 1926, 1921.
B A., Cambridge University, 1906; M.A., *ibid.*, 1919; A.M., University of Chicago, 1916; Ph.D., *ibid.*, 1922.

*Absent on leave.

TURNER, MARCIA E., Associate Professor of Home Economics Education, 1922, 1919.
B.S., Kansas State College, 1917; M.A., University of Chicago, 1919;

VIFQUAIN, RUSSELL MANNING, Personnel Officer of Agricultural Division and Director of Short Courses, 1920.
A.B., Nebraska Wesleyan University, 1915; M S., University of Missouri, 1917.

WAKELEY, RAYMOND EARL, Associate Professor of Sociology, 1935, 1930.
B.S., Pennsylvania State College, 1917; M.S., University of Wisconsin, 1924; Ph D., Cornell University, 1928.

WALKER, RUDGER H., Associate Professor of Soils, 1932, 1924.
B.S., Brigham Young University, 1923; M.S., Iowa State College, 1925; Ph.D , *ibid.*, 1927.

WEBBER, HENRY ALBERT, Associate Professor of Chemical Engineering, 1929, 1923.
B.S. (Ch.E.), University of Colorado, 1923; M.S , Iowa State College, 1925; Ph.D., *ibid.*, 1929.

WENTZ, JOHN BUDD, Associate Professor of Farm Crops, 1921.
B.S.A., North Dakota Agricultural College, 1913; M.S., Cornell University. 1916; Ph.D., *ibid.*, 1928.

WILCKE, HAROLD L., Associate Professor of Poultry Husbandry, 1935, 1929.
B.S., Iowa State College, 1927; M.S., *ibid.*, 1932; Ph.D., *ibid.*, 1935.

WRIGHT, WALLACE, Associate Professor of Economics, 1931, 1930.
A.B., Dartmouth College, 1919; M.A , Stanford University, 1924; Ph.D , *ibid.*, 1930.

YEAGER, JAMES FRANKLIN, Associate Professor of Zoology and Entomology, 1931, 1930.
Ph.B., Yale University, 1924; M.A., Columbia University, 1926; Ph.D., New York University, 1929.

ASSISTANT PROFESSORS

ANDERSON, C. ARNOLD, Agricultural Economics, 1935.
B.A., University of Minnesota, 1927; M.A., *ibid.*, 1928; Ph D., Harvard University, 1932.

ANDERSON, HAROLD WILLIAM, Electrical Engineering, 1931.
B S , (E E.), University of Kansas, 1921; E.E., *ibid.*, 1929; M.S., Massachusetts Institute of Technology, 1931, Sc D., *ibid.*, 1934.

ATANASOFF, JOHN VINCENT, Mathematics and Physics, 1930, 1925.
B.S., University of Florida, 1925; M.S , Iowa State College, 1926; Ph.D , University of Wisconsin, 1930.

BAKER, MERLE PORTER, Dairy Industry, 1926, 1922.
B.S., Iowa State College, 1921; M.S., *ibid.*, 1923; Ph D., *ibid.*, 1931.

BEARD, FRED J., Animal Husbandry, 1932.
B.S., Oklahoma Agricultural and Mechanical College, 1920; M S., Iowa State College, 1924.

BECKMAN, RICHARD W , Technical Journalism, 1931.
B.S., Iowa State College, 1925.

BENEDICT, ARIEL A., Physics, 1919.
A.B , Ohio Wesleyan University, 1913; A.M., Ohio State University, 1915.

BENTLEY, RONALD CHARLES, Economics and Sociology, 1934, 1925.
B.S., North Dakota Agricultural College, 1923; M.S., *ibid.*, 1924.

BIRD, EMERSON W., Dairy Industry and Chemistry, 1928, 1923.
B S., Pennsylvania State College, 1923; Ph.D , Iowa State College, 1929.

BORGESON, REUBEN W., Chemistry, 1928, 1922.
A.B., Denver University, 1919; M.S , Iowa State College, 1924; Ph D., *ibid.*, 1928.

BRANDT, A. E., Mathematics, 1930, 1924.
B S., Iowa State College, 1917; M.S., *ibid.*, 1926; Ph.D , *ibid.*, 1932.

BROWN, ORAL A., Electrical Engineering, 1929, 1924.
B.S. (E.E.), West Virginia University, 1924; M S , Iowa State College, 1925; Ph.D., *ibid.*, 1932.

BUTLER, LEE WRIGHT, Physics, 1921, 1919.
A.B., Simpson College, 1914.

BYRAM, HAROLD M., Vocational Education, 1926.
B.S., Iowa State College, 1924; M.S., *ibid.*, 1928; Ph D., Columbia University, 1933.

CHADDERDON, HESTER, Home Economics Education, 1929.
B.S., University of Nebraska, 1924; M.A., University of Chicago, 1928.

DANIELLS, MARIAN ELIZABETH, Mathematics, 1919, 1914.
A B., Kalamazoo College, 1908; A.B., University of Chicago, 1908; M.S , Iowa State College, 1919.

DAUBERT, C. E., Physical Education, 1925, 1920.

DORCHESTER, CHARLES S., Farm Crops, 1916, 1913.
B.S., Iowa State College, 1913; M S., University of Minnesota, 1923; Ph D , Iowa State College, 1935.

DUDLEY, FRED ADAIR, English, 1934, 1926.
A.B., Oberlin College, 1923; M.A., Columbia University, 1930.

EDGAR, ALVIN R., Music, 1935.
B.A., Upper Iowa University, 1924; M.A., State University of Iowa, 1935.

ELDREDGE, JOHN C., Farm Crops, 1921.
B S. (Agronomy), Iowa State College, 1915; M.S., *ibid*, 1925; Ph. D , *ibid.*, 1933.

ESPE, DWIGHT LEONARD, Dairy Husbandry, 1930.
B.S., Iowa State College, 1922; M S., New York Agricultural College, 1927; Ph.D , Cornell University, 1930.

FLEMING, ANNIE WILSON, Mathematics, 1915, 1900.
B.S., Iowa State College, 1894; M.S., University of California, 1921.

FOSTER, MYRTLE HINDERMAN, Physical Education, 1926.
B S., University of Minnesota, 1922.

FULLER, ELIZABETH GENEVIEVE, English, 1931, 1916.
A.B., University of Illinois, 1916; A.M., University of Michigan, 1922.

GALLIGAN, WILLIAM EDWARD, Civil Engineering, 1929, 1926.
B S. (C.E), University of Missouri, 1925; M S , Iowa State College, 1930

GOULDING, FERN A., Hygiene, 1930, 1929.
R N , University of Michigan, 1913, A B , Olivet College, 1925

GRANT, JOHN GRAY, Hygiene, 1930.
B A., McMaster University, Toronto, 1919; M.D , University of Manitoba, 1924.

HABER, ERNEST S., Horticulture, 1928, 1920.
B S , Ohio State University, 1918; M.S , Iowa State College, 1922, Ph D., *ibid.*, 1928.

HANSON, A. MAURICE, Landscape Architecture, 1934.
B.S., Iowa State College, 1928.

HARTMAN, GEORGE BERNHARDT, Forestry, 1935.
B.S. (For.), Iowa State College, 1917.

HAYDEN, ADA, Botany, 1919, 1910.
B.S., Iowa State College, 1908; M.S., Washington University, 1910; Ph.D., Iowa State College, 1918.

HEMPSTEAD, JEAN CHARLES, General Engineering, 1932, 1930.
B.S., Iowa State College, 1926; M.A., University of Pennsylvania, 1930.

HENDERSON, ANNA M., Applied Art, 1919, 1916.
Rockford College, 1897; Diploma, Minneapolis School of Design and Normal Art, 1915.

HENDRICKSON, GEORGE OSCAR, Zoology and Entomology, 1930, 1925.
B.A., Iowa State Teachers College, 1921; M.S., Iowa State College, 1926; Ph.D., *ibid.*, 1929.

HINRICHSEN, JOHN JAMES LUETT, Mathematics, 1930, 1929.
B.S., Iowa State College, 1925; A.M., Harvard University, 1927, Ph.D., *ibid.*, 1929.

HOLBERT, J. C., Animal Husbandry, 1929, 1923.
B.S., Iowa State College, 1923; M.S., *ibid.*, 1925.

*HORNING, WALTER H., Forestry, 1929.
B.S., Pennsylvania State Forest School, 1914; M.S., University of California, 1928.

HUG, JOHN, Mechanical Engineering, 1913, 1909.
B.M.E., Iowa State College, 1909; M.E., *ibid.*, 1934.

JENSEN, VERNON P., Theoretical and Applied Mechanics, 1932, 1931.
B.S. (C.E.), University of Illinois, 1929; M.S. (T.&A.M.), *ibid.*, 1931.

JOHNS, IRAL BROWN, JR., Chemistry, 1931, 1926.
B.S., Knox College, 1924; Ph.D., Iowa State College, 1930.

KALAR, SARA BLAINE, Hygiene, 1930.
M.D., Keokuk Medical College, 1903.

KEHLENBECK, ALFRED PAUL, Modern Languages, 1935.
B.A., State University of Iowa, 1927; M.A., *ibid.*, 1928; Ph.D., University of Wisconsin, 1934.

KING, WALTER BERNARD, Chemistry, 1931, 1923.
B.S., University of Illinois, 1923; M.S., Iowa State College, 1924; Ph.D., *ibid.*, 1930.

LAMBERT, WILLIAM VINCENT, Genetics, 1928, 1923.
B.S., University of Nebraska, 1921; M.S., Kansas State Agricultural College, 1923; Ph.D., University of California, 1931.

LARSEN, JULIUS A., Forestry, 1924.
B.A., Yale, 1908; M.F., *ibid.*, 1910.

LEITH, THOMAS SEETER, Veterinary Anatomy, 1929, 1916.
D.V.M., Iowa State College, 1914.

L'ENGLE, LOUISE, Foods and Nutrition, 1929.
B.A., Goucher College, 1922; M.S., Teachers College, Columbia University, 1929.

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*Absent on leave.

LENROW, BERNARD, Public Speaking, 1932, 1930.
A.B., Cornell University, 1926.

LEWIS, JOHN H., JR., Military Science and Tactics, 1932.
U. S. Military Academy, 1918; Graduate, Field Artillery School, Basic Course, 1920; Capt. F. A.

LIVINGSTON, EVERETT GORDON, Industrial Arts, 1931.
B.S., Kansas State Teachers College, 1926; M.S., Iowa State College, 1930.

LOWENBERG, MIRIAM ELIZABETH, Foods and Nutrition, and Child Development, 1932, 1927.
Ph.B., University of Chicago, 1918; M.S., Iowa State College, 1929.

LYLE, MARY S., Home Economics Education, 1930, 1923.
B.S., Purdue University, 1921; M.S., Iowa State College, 1924.

MANNING, TRUMAN WEST, Economics, 1930, 1924.
B.S., Iowa State College, 1911; M.S., *ibid.*, 1929.

MARLOW, KYLE FAYETTE, Modern Languages, 1931, 1925.
B.L., University of Minnesota, 1899; M.A., French School, Middlebury, Vt., 1923.

MARVIN, KENNETH L., Technical Journalism, 1934, 1923.
B.S., Iowa State College, 1923.

MATLACK, JESSE B., Military Science and Tactics, 1933.
U.S. Military Academy, 1917; Graduate, Field Artillery School, Battery Officers' Course, 1925; Graduate, Field Artillery School, Advanced Course, 1933; Capt., F. A.

MCCRACKEN, EARL C., Physics, 1934, 1919.
B.S., Drake University, 1918; M.S., Iowa State College, 1929; Ph.D., University of Minnesota, 1934.

MCKIBBEN, HAZEL, Home Economics Education, 1935, 1927.
B.S., Iowa State College, 1924; M.S., *ibid.*, 1930

MCMILLEN, ELLIOTT LEE, Chemical Engineering, 1935.
B.S. (Chem.E.), University of Minnesota, 1923; M.S. (Chem.E.), *ibid.*, 1927; Ph.D., *ibid.*, 1931.

MEYER, ALWINE HELENE, Textiles and Clothing, 1935.
A.B., University of Nebraska, 1920; B.S., *ibid.*, 1924; M.S., Iowa State College, 1932.

MILLER, FRANK CLIFFORD, Engineering Drawing, 1919.
B.S., James Millikin University, 1909; M.S., Iowa State College, 1935.

MURPHY, GLENN, Theoretical and Applied Mechanics, 1934, 1932.
B.S. (C.E.), University of Colorado, 1929; M.S. (C.E.), *ibid.*, 1930; M.S. (C.E.), University of Illinois, 1932; Ph.D., Iowa State College, 1935.

NIELSEN, HERLUF P., Mechanical Engineering, 1935.
B.S. (M.E.), University of Nebraska, 1924; M.M.E., Rensselaer Polytechnic Institute, 1925; Ph.D., University of Minnesota, 1933.

OBERHEIM GRACE MYRTLE, Loan Librarian, 1930, 1923.
A.B., University of Wisconsin, 1920.

PETERSON, JOHN BOOTH, Farm Crops and Soils, 1933, 1928.
B.S., Oregon State College, 1928; M.S., Iowa State College, 1929.

PHILLIPS, S. DALE, Architectural Engineering, 1930, 1928.
Graduate in Art, Minneapolis School of Art, 1927.

POTGIETER, FANNIE, Textiles and Clothing, 1934, 1931.
B.A., University of Iowa, 1922; M.A., University of Washington, 1928.

PRATT, GROVER MARTIN, Architectural Engineering and Engineering Drawing, 1928, 1925.
B.S. (Arch.), Syracuse University, 1911.

REID, MARGARET GILPIN, Economics, 1930.
B.S. (H.Ec.), University of Manitoba, 1921; Ph.D., University of Chicago, 1931.

RICHARDS, LORENZO ADOLPH, Soils and Physics, 1935.
B.S., Utah State College, 1926; M.A., *ibid.*, 1927; Ph.D., Cornell University, 1931.

ROTHACKER, RALPH RUDOLPH, Landscape Architecture, 1925, 1922.
B.S., Ohio State University, 1918; M.S., Iowa State College, 1924.

RUSSELL, MABEL, Applied Art, 1919, 1916.
Diploma, Pratt Institute, 1915; Ph.B., University of Chicago, 1925; M.S., Iowa State College, 1933.

SASS, JOHN EUGENE, Botany, 1930, 1928.
B.S, University of Michigan, 1924; M S., *ibid*,. 1925; Ph.D., *ibid.*, 1929.

SATER, LENORE ESTELINE, Household Equipment, 1931, 1928.
B.S., Drake University, 1920; M.S., Iowa State College, 1930.

SCHANÇHE, ARTHUR NORMAN, Hygiene, 1930.
B.S., University of South Dakota, 1923; M.D., Washington University, 1925.

SCHILLETTER, JULIAN CLAUDE, Horticulture, 1928, 1922.
B.S., Clemson College, 1922; M.S., Iowa State College, 1923; Ph.D., *ibid.*, 1930.

SCHRAMPFER, WILLIAM H., Agricultural Economics, 1933, 1929.
B A., University of Iowa, 1926; J.D., *ibid.*, 1928.

SCHMIDT, HARRY J., Physical Education, 1929, 1926.
B.S., Iowa State College, 1925.

SHILLING, IDA MAY, Foods and Nutrition, 1923.
B.S., Ohio State University, 1910; M.S., University of Chicago, 1923.

SMITH, JOHN ELIPHALET, Geology, 1917.
B.S., Oregon Agricultural College, 1902; M.S., Iowa State College, 1911.

STORKE, HARRY P., Military Science and Tactics, 1934.
B.S., U. S. Military Academy, 1926; Field Artillery School, 1931; 1st Lieut., F. A.

TOWNE, LAURA, Modern Languages, 1926, 1920.
B.A., University of Wisconsin, 1914; M A., *ibid.*, 1920.

TRUSKOWSKI, JOSEPH E., Physical Education, 1932.
A.B., University of Michigan, 1930.

VANGIESEN, W. O., Military Science and Tactics, 1934.
B.S., Michigan State College, 1926; Engineer School, 1932; 1st Lieut., Corps of Engineers.

WALLACE, KARL RICHARDS, Public Speaking, 1933, 1927.
A.B., Cornell University, 1927; A.M., *ibid.*, 1931; Ph.D., *ibid.*, 1933.

WARNER, ELEANOR FRANCES, Serials Librarian, 1930, 1923.
B.A., Ohio Wesleyan University, 1912; M.A., *ibid.*, 1913; B.L.S., University of Illinois, 1919.

WARNER, LEO V., Military Science and Tactics, 1934.
U. S. Military Academy, 1917; Graduate, Field Artillery School, 1922; Capt., F. A.

WATERS, NELSON FENN, Poultry Husbandry, 1931.
B Sc., Connecticut State College, 1925; M.Sc., Harvard University, 1930. D.Sc., *ibid.*, 1931.

WHAN, FOREST LIVINGS, Public Speaking, 1932, 1930.
B.S., Kansas State College, 1928; M.A., University of Illinois, 1931.

WHITLOCK, STANLEY CLARKE, Veterinary Anatomy, 1934, 1929.
B.S., Michigan State College, 1927; D.V.M., *ibid.*, 1929; M.A., University of Michigan, 1931.

WILCOX, WALTER W., Agricultural Economics, 1935.
B.S., Iowa State College, 1928; M.S., University of Illinois, 1930.

WILLIS, BENJAMIN SUTTON, Electrical Engineering, 1927, 1924.
B.S. (E.E.), University of Minnesota, 1917; E.E, Iowa State College, 1926; M.S., *ibid.*, 1929.

WILLSON, LAWRENCE HERRICK. Physics, 1920, 1919.
A.B., Valparaiso University, 1913; B.S., University of Chicago, 1914.

INSTRUCTORS

ANDERSON, ERNEST WILLARD, Mathematics, 1928, 1926.
B.S., North Dakota Agricultural College, 1926; M.S., Iowa State College, 1928; Ph.D., *ibid.*, 1933.

ANDERSON, MABEL, Institution Management, 1932.
B.S., University of Minnesota, 1919.

ANDERSON, WALTER RAYMOND, Veterinary Obstetrics, 1935.
D.V.M., Iowa State College, 1930.

AYRES, DON P., Architectural Engineering, 1932.
B.S. (Arch.), University of Illinois, 1928; M.S. (Arch.), *ibid.*, 1930.

BERKEL, HOWARD J., Engineering Drawing, 1935.
B.S. (C.E.), Michigan State College, 1931; M.S. (C.E.&Ec.), *ibid.*, 1933.

BICKFORD, WILLIAM GLENN, Chemistry, 1929.
A.B., Southwestern College, 1927.

BOWMAN, MARY JEAN, Economics, 1934.
A.B., Vassar, 1930; A.M., Radcliffe, 1932.

BRANDNER, FRED A., Mathematics, 1922.
B.S., Kansas State Teachers College, 1921; M.S., University of Chicago, 1923.

BRECKENRIDGE, ROBERT W., Mechanical Engineering, 1929.
B.S., Iowa State College, 1932; M.S., *ibid.*, 1934.

BUCHANAN, DORIS LAVINA, Textiles and Clothing, 1935.
B.S., University of Texas, 1931; M.A., Teachers College, Columbia University, 1933.

BUCHHOLTZ, WALTER FREDERICK, Botany, 1935, 1929.
B.S., Iowa State College, 1929; M.S., *ibid.*, 1930; Ph.D., *ibid.*, 1935.

BURNS, WILLIAM EARP, Bacteriology, 1930, 1929.
A.B., Southwestern College, 1913; M.S., Kansas University, 1915; Ph.D., Iowa State College, 1934.

CARTER, WILLIAM HOBART, Agricultural Engineering, 1930.
B.S., Iowa State College, 1929; M.S., *ibid.*, 1934.

CASTONGUAY, THOMAS T., Chemistry, 1934.
B. (Met.) Engr., University of Detroit, 1931.

COCKING, ROGER MILTON, Veterinary Anatomy, 1934.
D.V.M., Iowa State College, 1934.

COOK, ROSALIND, Music, 1926, 1921.
Mus. B., Ellsworth College, 1917.

COOK, THOMAS L., Economics, 1927, 1926
B.S., Iowa State College, 1926; M.S., *ibid.*, 1927.

DACHTLER, W. C., Industrial Economics, 1935.
B.S., Iowa State College, 1930.

ELKINTON, CHARLES MOORE, Economics, 1934, 1933.
B.S., M.S., University of Wisconsin, 1932.

ENBLOM, VILLA MAY, Foods and Nutrition, 1934, 1933.
B.S., University of Minnesota, 1932; M.S., Iowa State College, 1934.

ERNST, GEORGE CAMPBELL, Theoretical and Applied Mechanics, 1930.
B.S., (C.E.), University of Michigan, 1929; M.S., Iowa State College, 1932.

FABRICIUS, N. E., Dairy Industry, 1928.
B.S., Iowa State College, 1928; M.S., *ibid.*, 1930.

FLEMING, MABEL ALICE, English, 1912.
B S., Iowa State College, 1911.

FOLADARE, JOSEPH, English, 1935.
B.S , California Institute, 1930; M.A., Claremont Colleges, 1931.

GABRIELSON, MARY L., Textiles and Clothing, 1921.
B S., Kansas State College, 1911; M.A., Columbia University, 1918.

GESSER, CARL C., Foundry, Mechanical Engineering, 1922

GOEPPINGER, KATHERINE, Technical Journalism, 1935.
B.S., Iowa State College, 1924.

GREER, JOSHUA WILBUR, Chemistry, 1930, 1928.
B.S., Western Illinois State Teachers College, 1922.

HASSINGER, RUTH MARIA, Physical Education, 1935.
B.S., University of Minnesota, 1927.

HAUER, LOUIS FREDERICK, English, 1935.
B.A., University of Dubuque, 1931; M.A., State University of Iowa, 1933.

HAUSRATH, ALFRED H., JR., Vocational Education, 1928, 1927.
B.S., Iowa State College, 1922; M.S., *ibid*, 1929.

HESSLER, VICTOR PETER, Electrical Engineering, 1927, 1926.
B.Sc., Oregon State College, 1926; M.S, Iowa State College, 1927; Ph.D., *ibid.*, 1934.

HIGDON, ARCHIE, Mathematics, 1935, 1934.
B.S., South Dakota State College, 1928; M.S., Iowa State College, 1930.

HINES, THOMAS B., Forge Shop, Mechanical Engineering, 1920.

HOPKINS, HELEN, Physical Education, 1935.
B.S, University of Illinois, 1932.

HOPPE, MANLEY, R., Chemical Engineering, 1934, 1932.
B.S., Iowa State College, 1932; M.S., *ibid.*, 1935.

HOSTETLER, PIUS H., Dairy Industry, 1935.
B.S., Kansas State College, 1934.

IRELAND, FRANK, Chemistry, 1935, 1930.
B.S., Union University, 1929.

JOHNSON, MAURICE JOSEPH, Veterinary Surgery, 1932.
D.V.M., Iowa State College, 1932.

KARLSON, ALFRED GUSTAV, Veterinary Hygiene, 1935.
B.S., Iowa State College, 1934; D.V.M., *ibid.*, 1935.

KEMPF, CLAYTON ARFORD, Chemistry, 1935, 1933.
A.B., Drake University, 1930; M.S., State College of Washington, 1932.

KIRKMAN, JOHANNA C. FEDSON, English, 1918.
B.S., Iowa State College, 1906; M.S., *ibid.*, 1928.

KIRKPATRICK, MARY, Foods and Nutrition, 1930.
B.S., Kansas State College, 1919; M.S., University of Chicago, 1930.

KITT, EMMA G., Applied Art, 1927.
Diploma, Chicago Art Institute, 1926.

KREUTZER, WILLIAM A., Botany, 1934.
B.S., Colorado Agricultural College, 1930; M.S., *ibid.*, 1932.

LEPLEY, MARION C., Applied Art, 1927, 1926.
B.S., Iowa State College, 1922; M.S., *ibid.*, 1931.

LIGHTBURN, FRANK E, Theoretical and Applied Mechanics, 1931.
B.S. (E.E.), University of Colorado, 1931; M.S., Iowa State College, 1935.

LOGAN, JOHN A., Civil Engineering, 1935.
B.S., University of Saskatchewan, 1929; B.S. (C.E.), *ibid.*, 1934; M.S. (San. Engr.), Harvard University, 1935.

LYKKEN, LOUIS, Chemistry, 1928, 1927.
B.S., South Dakota School of Mines, 1927; Ph.D., Iowa State College, 1933.

MCCLESKEY, CHARLES SHELTON, Bacteriology, 1927.
B.S., Texas A. & M. College, 1924; M.S., Iowa State College, 1926; Ph.D., *ibid.*, 1930.

MCCOMB, A. L., Forestry, 1935, 1932.
B.S., Pennsylvania State College, 1932; M.S., Iowa State College, 1933.

MCDOWELL, CLARENCE MERLE, Theoretical and Applied Mechanics, 1930.
B.S. (M.E.), University of Illinois, 1924; M.S., Iowa State College, 1933.

MCINTOSH, GEORGE H., Chemistry, 1929, 1928.
B.A., Simpson College, 1928; Ph.D., Iowa State College, 1934.

MCMULLEN, ELLA GERTRUDE, Institution Management, 1935.
B.S., Iowa State College, 1933.

MAC ARTHUR, JESSIE ANDERSON, English, 1914.
B.A., University of Iowa, 1910; M.A., *ibid.*, 1911.

MAITLAND, ANDREW, Machine Shop, Mechanical Engineering, 1920.

MAITLAND, WILLIAM, Machine Shop, Mechanical Engineering, 1921.

MARTIN, FRANK S., Chemistry, 1935, 1933.
B.S., Kansas State College, 1933.

MATHIS, LELAND STANFORD, English, 1936.
A.B., Iowa State Teachers College, 1929; A.M., State College of Washington, 1931.

MENZEL, RALPH EDGAR, Chemistry, 1934, 1929.
B.A., Upper Iowa University, 1920.

MILBY, THOMAS THEODORE, Poultry Husbandry, 1934, 1931.
B.S., University of Kentucky, 1931; M.S., Iowa State College, 1932; Ph.D., *ibid.*, 1934.

MILLER, HAROLD J., Engineering Drawing, 1925.

MILLER, RUSSEL D., Physics, 1926.
B.S., Iowa State College, 1921; M S., *ibid.*, 1928.

MOORE, PERRY A., Chemistry, 1929, 1925.
B.S. (Chem.), Des Moines University, 1925; M.S., Iowa State College, 1926.

MOOREHOUSE, GRETCHEN LUMBARD, Physical Education, 1933.
A.B., Drake University, 1930; M.S., Johns Hopkins University, 1933.

MUMFORD, MARY, Child Development, 1935, 1926.
B.A., University of Illinois, 1924; M.S., Iowa State College, 1932.

NESS, ZENOBIA B., Applied Art, 1924.

NIEMACK, ILZA, Music, 1935.
Graduate, Chicago Musical College, 1919

OLSON, HAROLD CECIL, Dairy Industry, 1934, 1932.
B.S., South Dakota State College, 1928; M.S., West Virginia University, 1930; Ph.D., Iowa State College, 1932.

PAGELS, GEORGE, JR., Theoretical and Applied Mechanics, 1935, 1934.
B.S. (C.E.), University of Illinois, 1934; M.S., Iowa State College, 1935.

PAUSTIAN, RAYMOND GEORGE, Civil Engineering, 1930.
B.S., Iowa State College, 1929; M.S., *ibid.*, 1931; C.E., *ibid.*, 1934.

PECKINPAUGH, MARY, Home Economics Education, 1935, 1934.
B.S., Iowa State College, 1930.

PETERSEN, GEORGE M., Ceramic Engineering, 1930.
B.S. (L.A.), Iowa State College, 1922; B.S. (Cer), *ibid.*, 1930.

PINNEY, LOUIS ERWIN, Physics, 1931, 1930.
A.B., University of Missouri, 1925; M.A., *ibid.*, 1927.

PRUGH, HARRY I., Economics, 1934, 1930.
A.B., Coe College, 1930; M.S , Iowa State College, 1931

QUINTUS, PAUL E.. Agricultural Economics, 1934,
B.A., Coe College, 1928; M.S , Iowa State College, 1931; Ph.D., University of Minnesota, 1934.

ROBERTSON, L. FRED, Mathematics, 1927.
A.B., Indiana University, 1924; A M., *ibid.*, 1927.

ROUDABUSH, ROBERT LEE, Zoology and Entomology, 1935, 1931.
A.B., Lebanon Valley College, 1931; M S., Iowa State College, 1932.

SAFFORD, RUTH BOGARDUS, English, 1908.
B.L., University of Wisconsin, 1903.

SCHICKELE, RAINER WOLFGANG, Agricultural Economics, 1935.
"Diploma-Landwirt," Berlin, College of Agriculture, 1929; Ph.D., *ibid.*, 1931.

SEVERANCE, GRACE, Institution Management, 1935, 1934.
B.S., State College of Washington, 1931.

SCHROEDER, IRA, Carilloneur, Music, 1931.
B.Mu., Bush Conservatory of Music, 1927.

SHULTZ, EDNA LONGSTRETH, English, 1935.
A.B., Drake University, 1926.

SIELING, DALE H., Chemistry, 1935, 1932.
B.S., Kansas State College, 1931; M.S , *ibid.*, 1932.

SMITH, DWIGHT A., Veterinary Medicine, 1932.
D.V.M., Iowa State College, 1932.

SMITH, HELEN FLORENE, Mathematics, 1907.
A.B., Cornell University, 1902; M.S., Iowa State College, 1921.

SPANGLER, EDWARD MERRIT, Pattern Shop, Mechanical Engineering, 1905, 1904.

STEVENS, DONALD S., Engineering Drawing, 1934.
B.S., Iowa State College, 1931; M.S., *ibid.*, 1933.

STILES, WILLIAM B., General Engineering, 1934.
B.S., Iowa State College, 1932.

STONE, SIDNEY C., Public Speaking, 1930.
A.B., Ohio Wesleyan University, 1929; M.A., *ibid.*, 1933.

SULLIVAN, LEONORE MARGARET, Institution Management, 1930, 1928.
B.S., Montana State College, 1927; M.S., Iowa State College, 1929.

SUNDERLIN, EDITH MARYBELLE, Child Development, 1934.
B.S., Iowa State College, 1924; M.A., University of Iowa, 1931.

SWINGLE, EDITH, Bacteriology, 1934.
B.S., Montana State College, 1928, Ph.D., University of Chicago, 1934.

TAUBER, OSCAR E., Zoology and Entomology, 1935, 1930.
B S., James Millikin University, 1930; M S., Iowa State College, 1932; Ph D., *ibid.*, 1935.

TETER, EDNA RHOADS, Applied Art, and Textiles and Clothing, 1927, 1925.
B.S., Iowa State College, 1920; M.S., *ibid.*, 1933.

TIMM, LEROY C., Physical Education, 1934.
B.S., University of Minnesota, 1931; M.A., New York University, 1933.

UNDERKOFLER, LELAND ALFRED, Chemistry, 1935, 1928.
A.B., Nebraska Wesleyan University, 1928; Ph.D., Iowa State College, 1934.

VAILE, ROBERT BRAINARD, JR., Electrical Engineering, 1934.
B.S., (E E.), California Institute of Technology, 1927.

VANWINKLE, GEORGE FRANKLIN, JR., General Engineering, 1934.
B.S. (M.E.), Montana State College, 1934.

WALKER, ALBERT LYELL, English, 1935.
B A., Park College, 1929; M.A., State University of Iowa, 1930, Ph.D., *ibid*, 1936.

WALLACE, ERNEST LEON, English, 1925.
A.B., College of Emporia, 1924; A.M., University of Kansas, 1926.

WALLER, ERNEST FREDERICK, Veterinary Pathology, 1934.
D.V.M., Iowa State College, 1931.

WAUGH. ALICE, Applied Art, 1927.
B.S., Missouri State University, 1916.

WELLS, MARSHALL, Physical Education, 1935.
B S., University of Minnesota, 1933.

WILHELM, HARLEY ALNEY, Chemistry, 1928, 1927.
A B., Drake University, 1923; Ph D., Iowa State College, 1932.

WOODY, OSCAR G., Architectural Engineering, 1930.
B.S. (Arch.), Kansas State College, 1925.

ASSISTANTS

CALHOUN, M. LOIS, B.S., M.S., Veterinary Anatomy, 1932, 1928.
CHADDOCK, THEODORE THOMAS, B.S., M.S., Veterinary Pathology, 1935, 1934.
DUNCAN, CARL DAVIS, B.S., Dairy Industry, 1934.
HOLM, GLENN CARLOS, B.S., M.S., Veterinary Hygiene, 1933.
JONES, LEO MEYER, A.B., Veterinary Physiology and Pharmacology, 1935
NIELSEN, VERNER H., Dairy Industry, 1932.
SLOSS, MARGARET W., B.S., M.S., Veterinary Pathology, 1929, 1923.

GRADUATE ASSISTANTS

ADAMS, JAMES A., B.S., M.S., Zoology and Entomology, 1931.
BARNETT, MAXWELL MCCLELLAND, B.S., M.S., Chemistry, 1935.
BARR, MILDRED, B.S., M.S., Chemistry, 1935, 1930.
BENSON, RICHARD ERNEST, B.S., Chemical Engineering, 1935.
BERGSTRAND, EVALYN SOPHIA, M.S., Home Management, 1935.
BOAST, WARREN B., B.S., M.S., Electrical Engineering, 1934.
BRIDGER, GROVER L., B.S., M.A., Chemical Engineering, 1935.
BINDSCHADLER, ERNEST, B.S., M.S., Chemistry, 1935.
BROWN, ELLIS V., B.S., Chemistry, 1930.
BUCHANAN, BEN F., A.B., Chemistry, 1934.
COHEE, R. F., JR., B.S., M.S., Chemistry, 1934.
COOK, ROY H., B.S., Mathematics, 1935, 1934.
DAGUE, ZELLA, B.S., Home Management, 1935.
DAVIES, LEWIS M., B.A., Industrial Economics, 1935.
DAVIS, LEONARD REID, B.S., M.S., Zoology and Entomology, 1935, 1931.
EATON, GERALD ALMOND, B.S., Chemistry, 1935.
FISHER, ROBERT ALEXANDER, B.S., M.S., Zoology and Entomology, 1934.
FOOTE, RICHARD JAY, B.S., Agricultural Economics, 1935.
FRANZ, RAYMOND A., B.S., Chemistry, 1929.
GOETHE, NELLIE M., B.S., Institution Management, 1935.
GREAVES, IDA CECIL, B.A., M.A., Ph.D., Consumers Economics, 1935.
GREENWOOD, DELBERT ABRAM, B.S., M.S., Chemistry, 1930.
GRIFFIN, R. AUSTIN, B.A., M.S., Agricultural Economics, 1935, 1934.
GRIFFITH, ROBERT H., B.S., Chemistry, 1935.
GUNDERSON, HAROLD, B.S., M.S., Zoology and Entomology, 1935.
HARVEY, PAUL H., B.S., Genetics, 1934.
HETZER, HERBERT O., M.S., Ph.D., Genetics, 1931, 1930.
HUNTER, JOSEPH EVERETT, JR., B.S., M.S., Chemistry, 1935.
HUNTER, HELEN HANNA, B.S., Home Economics Education, 1935.
INGELS, JOHN W., B.S., Dairy Husbandry, 1935.
JOHNSON, J. STUART, B.S., M.S., Electrical Engineering, 1934.
JONES, MAURINE LENORE, A.B., M.S., Chemistry, 1934.
KELLEY, MYRON TRUMAN, B.S., M.S., Chemistry, 1934, 1933.
KENT, GEORGE CLARENCE, B.A., Botany, 1935, 1933.

LOVRIEN, RUTH ELLEN, B.S., Technical Journalism, 1935.
MCCRORY, JOHN R., B.S., Economics, 1934.
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MARTIN, MARGARET, B.A., M.A., Consumers Economics, 1935.
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RAYMAN, MORTON M., B.S., Chemistry, 1934.
RIEKE, MARLYS CRYSTAL ARLYNN, B.A., Chemistry, 1935.
ROEHM, LUTHER S., A.B., A.M., Chemistry, 1934.
RUBY, WILLARD R., B.S., Chemistry, 1931, 1930.
SEAMAN, GERALD LEROY, B.S., Technical Journalism, 1935.
SNOKE, CHARLES E., A.B., M.A., Mathematics, 1935.
SNIPES, BENJAMIN THOMAS, B.S., M.S., Zoology, 1934.
STEVENSON, GLADYS TIMSON, B.A., Foods & Nutrition, 1931.
STRAND, NORMAN, B.S., M.S., Agricultural Economics, 1935.
SWISLOWSKY, JACOB, B.S., M.S., Chemistry, 1934.
TUTHILL, LEONARD DALE, A.B., M.A., Zoology and Entomology, 1935.
VAN ESS, MRS. MARIAN J. W., B.S., M.S, Chemistry, 1932, 1929.
YOUNG, RICHARD V., B.S., Chemistry, 1931.
ZERWICK, LOUISE ROSE, B.S., Home Management, 1935.

FELLOWS AND SCHOLARS

ARMSTRONG, WILLIAMINA ELIZABETH, B.S., M.S., Foods & Nutrition, 1934.
BOLIN, OREN, B.S., Agronomy, 1935.
BRYANT, HIGBEE WAYNE, B.S., Dairy Industry, 1935.
COUNTRYMAN, MORTON ALDEN, B.S., M.S., Physics, 1933, 1932.
DAVIS, CHARLES H., B.S., Agronomy, 1935.
DAWSON, VERA L., B.S., M.S., Chemistry, 1935, 1934.
DUNDON, WARREN JAMES, B.S., Chemistry, 1935.
FREDERICK, JULIAN ROSS, B.S., Physics, 1935.
GAGE, ROBERT PAUL, A.B., Mathematics, 1935.
GAINES, J. C., JR., B.S., M.S., Zoology and Entomology, 1935.
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MITCHELL, NANCY BOOTH, A.B., M.S., Bacteriology, 1935.

NAPS, MARGUERITE HARRIET, B.A., M.A., Chemistry, 1935.
POWERS, MYRON JOHN, B.S., M.S., Bacteriology, 1935, 1932
RAEDER, J. MILFORD, B.S., M.S., Botany, 1935, 1919.
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SEIFERLE, EDWIN JAMES, B.Ch.E., Chemistry, 1935.
SHELDON, LORISSA SUTHERLAND, B.S., Institution Management, 1935.
SHUBERT, MORAS L., A.B., Botany, 1935.
SNYDER, MARY ELLA, A.B., Child Development, 1935.
SOOTER, CLARENCE ANDREW, B.S., M.S., Zoology and Entomology, 1935.
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WHISTLER, ROY LESTER, B.S., M.S., Chemistry, 1935.
WILLIAMS, JOHN COVINGTON, A.B., M.A., Chemistry, 1935, 1933.
WILLINGHAM, JUDDIE JOHNSON, B.S., Dairy Industry, 1935.
WILSON, ROBERT G., B.S., M.S., Physics, 1934, 1932.

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WARNER, ELEANOR FRANCES, B.A., M.A., B.L.S., Serials Librarian, 1923.
OBERHEIM, GRACE M., B.A., Loan Librarian, 1923.
WIMERSBERGER, EVELYN G., B.A., B.S., Cataloger, 1924.
CRAWFORD, HELEN, B.A., B.S., Classifier, 1931.
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BORMANN, FLORENCE EVA, B.A., Assistant Reference Librarian, 1935
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KEMP, MURIEL LOUISE, B.S., Cataloger, 1934.
ROSENFIELD, ROSE, B.S., Cataloger, 1934.
CALLAHAN, MARY JOSEPHINE, B.A., M.A., B.S., Assistant, 1935.
ALLEN, MRS. ANNA F., B.S., Loan Assistant, 1924.
LEE, KATHERINE VIRGINIA, B.S.L.S., B.A., Assistant, 1935.
FORD, MRS. KATHLEEN, B.S., M.S., Instructor, Library Courses, 1933.
TERRELL, MRS. LEONA W., B.A., B.S.L.S., Assistant, Engineering Reading Room, 1934.
CARPENTER, ELVA L., B.S., Assistant, Reserve Room, 1934.
GINGER, RUTH DOROTHY, B.S., Assistant, 1935.
SUOMI, EMMA, B.S., Assistant, 1935.
JOHNS, BLANCHE B., A.B., Assistant, 1925.

THOMPSON, DONALD, B.S., Assistant, 1934.

CUNNINGHAM, JULES C., B.S., Special Bibliographer, 1934, 1911.

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SLOSS, THOMAS . . . . . Superintendent of Mechanical Equipment
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RICE. MRS. LOLA S., B.S. . . . . Assistant to the Dean

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FISHER, GENEVIEVE, B.S., A.M. . . . Personnel Officer, Home Economics
FULLER, G. M., B.A., M.B.A. . . . Personnel Officer, Industrial Science
STANGE, C. H., D.V.M. . . . . Personnel Officer, Veterinary Medicine

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GOULDING, FERN A., R.N., A.B. . . Head of Health Education for Women
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OHLSON, MARGARET, Ph.D. . . . . Dietitian
GANSCHOW, AMANDA . . . Chemical and Bacteriological Technician
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TAFF, PAUL C., B.S., Co-operator (Assistant Director of Agricultural Extension).
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CUNNINGHAM, J. C., B.S., Research Professor.

HEADS OF SECTIONS

BROWN, P. E., A.M., Ph.D., Research Professor and Head of Agronomy.
BUCHANAN, R.E., Ph.D., Research Professor and Head of Bacteriology.
CONVERSE, BLAIR, M.A., Research Professor and Head of Bulletin Office.
COOVER, W. F., A.M., D.Sc., Research Professor and Head of Chemistry.
DAVIDSON, J. B., B.S., D.Engr., Research Professor and Head of Agricultural Engineering.
DRAKE, C. J., Ph.D., Research Professor and Head of Entomology and Economic Zoology.

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FISHER, GENEVIEVE, A.M., Research Professor and Head of Home Economics.
LINDSTROM, E. W., Ph.D., Research Professor and Head of Genetics.
MACDONALD, G. B., M.F., Research Professor and Head of Forestry.
MELHUS, I. E., Ph.D., Research Professor and Head of Botany and Plant Pathology.
MORTENSEN, M., B.S.A., Research Professor and Head of Dairy Industry.
PICKETT, B. S., M.S., Research Professor and Head of Horticulture.
SHEARER, P. S., M.S., Research Professor and Head of Animal Husbandry.
SCHULTZ, T. W., Ph.D., Research Professor and Head of Rural Social Science and Economics.
SNEDECOR, G. W., M.A., Research Professor and Head of Statistics.
WERKMAN, C. H., B.S., Ph.D., Research Professor in Charge of Bacteriology.

HEADS OF SUB-SECTIONS

BROWN, P. E., Ph.D., Research Professor and Head of Soils.
CANNON, C. Y., Ph.D., Research Professor and Head of Dairy Husbandry.
CULBERTSON, C. C., Research Professor and Head of Animal Production, 1931, 1919.
B.S., Iowa State College, 1918; M.S., *ibid.*, 1925.
ERWIN, A. T., M.S., Research Professor and Head of Vegetable Crops.
HELSER, M. D., M.S., Research Professor and Head of Meats.
HENDERSON, E. W., Ph.D., Research Professor and Head of Poultry Husbandry.
HIXON, R. M., Ph.D., Research Professor and Head of Plant Chemistry.
HUGHES, H. D., M.S.A., Research Professor and Head of Farm Crops.
LUSH, J. L., Ph.D., Research Professor and Head of Animal Breeding.
MANEY, T. J., Research Professor and Head of Pomology, 1927, 1912.
B.S., Iowa State College, 1912.
NELSON P. MABEL, Ph.D., Research Professor and Head of Foods and Nutrition.
PEET, LOUISE J., Ph.D., Research Professor and Head of Household Equipment.
RATHBONE, ROSALIE, M.A., Research Professor and Head of Textiles and Clothing.
THOMAS, B. H., Ph.D., Research Professor and Head of Animal Chemistry and Nutrition.
VOLZ, E. C., M.S.A., Research Professor and Head of Floriculture.

RESEARCH PROFESSORS

BAKKE, A. L., Ph.D., Botany and Plant Pathology.
BERESFORD, REX, B.S., Co-operator, Agricultural Extension.
BUCHANAN, J. H., M.S., Co-operator, Chemistry.
BURNETT, L. C., Farm Crops, 1932, 1911.
B.S., University of Nebraska, 1903; M.S.A., Iowa State College, 1906.
COLLINS, E. V., Agricultural Engineering, 1932, 1914.
B.S., in Agr. Engr., Iowa State College, 1914; B.S. in Agronomy, *ibid.*, 1914.
COX, PAUL E., B.S., D.Sc., Co-operator, Ceramic Engineering.
FULLER, GEO. M., M.B.A., Co-operator, Economics.

GIESE, HENRY, M.S. (A.E.), (Arch.E.), Agricultural Engineering.
HAMMER, B. W., Ph.D., Dairy Industry.
IVERSON, C. A., M.S., Co-operator, Dairy Industry.
LANCELOT, W. H., B.S., D.Ed., Co-operator, Vocational Education.
MARTIN, J. N., Ph.D., Botany and Plant Pathology.
MURRAY, CHARLES, Pe.B., B.S., D.V.M., Co-operator, Veterinary Investigations.
NELSON, V. E., M.S., Co-operator, Chemistry.
PICKETT, B. S., M.S., Pomology.
RICHARDSON, C. H., Ph.D., Entomology and Economic Zoology.
RICHEY, H. W., B.Sc.A., Co-operator, Pomology.
SHEARER, P. S., M.S, Animal Breeding.
THOMPSON, S. H., Rural Social Science and Economics, 1921, 1914.
B.S., University of Minnesota, 1914; M.S., Iowa State College, 1923.
WOODROW, J. W., Ph.D., LL.D., Co-operator, Physics.

RESEARCH ASSOCIATE PROFESSORS

AIKMAN, J. M., Ph.D., Co-operator, Botany.
ALLBAUGH, L. G., M.S., Rural Social Science and Economics.
ARTHUR, IRA W., Rural Social Science and Economics, 1927, 1915.
B.S., Iowa State College, 1916; M.S., *ibid.*, 1927.
AYRES, Q. C., B.S., B.E., C.E., Co-operator, Agricultural Engineering.
CAINE, A. B., M.S., Animal Production.
DIETZ, S. M., Ph.D., Co-operator, Botany.
EDGAR, RACHEL, Ph.D., Textiles and Clothing.
FERGUSON, FRED E., Associate Bulletin Editor, 1931, 1924.
B.S., Iowa State College, 1922.
GAESSLER, W. G., Plant Chemistry, 1932, 1911.
B.S., Ohio State University, 1911; M.S., *ibid*, 1917.
GILMAN, J. C., Ph.D., Co-operator, Botany.
GOSS, E. F., M.S., Co-operator, Dairy Industry.
HAMLIN, H. M., Ph.D., Co-operator, Rural Education.
HANSEN, E. N., M.S., Dairy Husbandry.
HOPKINS, J. A., Ph.D., Rural Social Science and Economics.
LOOMIS, W. E., Ph.D., Co-operator, Botany.
LOWE, BELLE, M.S., Foods and Nutrition.
MCKIBBEN, E. G., M.S. (A.E.), Co-operator, Agricultural Engineering.
MORGAN, BARTON, Ph.D., Rural Social Science and Economics.
MURRAY, WM. G., Ph.D., Rural Social Science and Economics.
PARK, O. W., Ph.D., Entomology and Economic Zoology.
PORTER, R. H., Ph.D., Botany and Plant Pathology, Farm Crops.
REDDY, C. S., Botany and Plant Pathology, 1932, 1927.
B.S., University of Wisconsin, 1915; M.S., *ibid.*, 1916; Ph.D., *ibid.*, 1922.
ROBOTKA, FRANK, Rural Social Science and Economics, 1927, 1920.
B.S., University of Wisconsin, 1915; M.S., University of Minnesota, 1921.
SHEPHERD, G. S., Ph.D., Rural Social Science and Economics.
SMITH, F. B., Ph.D., Soils.
SWANSON, PEARL P., Ph.D., Foods and Nutrition.
THOMSON, R. B., M.F., Co-operator, Forestry.
WALKER, R. H., Ph.D., Soils.
WENTZ, J. B., Ph.D., Farm Crops.
WILCKE, H. L., Ph.D., Poultry Husbandry.

RESEARCH ASSISTANT PROFESSORS

BEARD, F. J., M.S., Meats.

BENTLEY, R. C., M.S., Rural Social Science and Economics.

BENTON, T. H., Soils, 1932, 1915.
B.S., McKendrie College, 1912; B.S., Iowa State College, 1914; M.S., *ibid.*, 1915.

BIRD, E. W., Ph.D., Dairy Industry.

BOATMAN, J. L., Soils, 1925, 1921.
B.S., Iowa State College, 1921; M.S., *ibid.*, 1924.

BRANDT, A. E., Ph.D., Co-operator, Mathematics.

DECKER, GEORGE C., Entomology and Economic Zoology, 1934, 1927.
B.S., Iowa State College, 1924; M.S., *ibid.*, 1927; Ph.D., *ibid.*, 1930.

DUNCAN, JOSEPH G., Assistant Bulletin Editor, 1935.
B.S., Iowa State College, 1934.

ELDREDGE, J. C., Ph.D., Farm Crops.

ENGLEHORN, A. J., Soils, 1930, 1925.
B.S., South Dakota State College, 1923; M.S., Iowa State College, 1925.

ERRINGTON, PAUL L., Entomology and Economic Zoology, 1932.
B.S., South Dakota State College, 1930; Ph.D., University of Wisconsin, 1932.

ESPE, D. L., Ph.D., Dairy Husbandry.

FORMAN, L. W., Superintendent of Experiments in Soils, 1923, 1910.
B.S., Iowa State College, 1909; M.S.A., *ibid.*, 1913.

HABER, E. S., Ph.D., Vegetable Crops.

HAMMOND, W. E., Superintendent of Experiments in Animal Production, 1928, 1920.
B.S., University of Minnesota, 1920; M.S., Iowa State College, 1921.

HAYDEN, ADA, Ph.D., Botany and Plant Pathology.

HOLBERT, J. C., M.S., Co-operator, Animal Husbandry.

KING, CHARLOTTE M., Botany and Plant Pathology.

LAMBERT, W. V., Ph.D., Genetics.

LANTZ, H. L., Pomology, 1928, 1916.
B.S., Oregon State College, 1916; M.S., Iowa State College, 1918.

MELDRUM, H. R., Soils, 1932, 1926.
B.S., Iowa State College, 1921.

ORRBEN, C. L., Soils, 1932, 1920.
B.S., Iowa State College, 1920.

PLAGGE, H. H., Pomology, 1932, 1918.
B.S., Iowa State College, 1916; M.S., *ibid.*, 1919; Ph.D., *ibid.*, 1932.

REID, MARGARET, Ph.D., Rural Social Science and Economics.

RICHARDS, A. R., Ph.D., Soils.

ROBINSON, J. L., Farm Crops, 1932, 1920.
B.S., Oklahoma Agricultural and Mechanical College, 1916; M.S., Iowa State College, 1918; Ph.D., *ibid.*, 1933.

SCHULZ, J.A., Animal Chemistry and Nutrition, 1932, 1921.
B.S., University of Illinois, 1917; M.S., Iowa State College, 1927.

WAKELEY, R. E., Ph.D., Rural Social Science and Economics.

WATERS, N. F., M.Sc., D.Sc., Poultry Husbandry.

WILCOX, WALTER W., M.S., Rural Social Science and Economics.

WILKINS, F. S., Farm Crops, 1920, 1914.
B.S., South Dakota State College, 1914; M.S., Iowa State College, 1915.

YODER, LESTER, Animal Chemistry and Nutrition, 1932, 1925.
B.S.A., Purdue University, 1916; M.S., *ibid.*, 1917.

RESEARCH ASSISTANTS

ANDRE, FLOYD, Entomology and Economic Zoology, 1931.
B.S., Iowa State College, 1931; M.S., *ibid.*, 1933.

BARRE, HENRY J., Agricultural Engineering, 1931, 1930.
B.S., Kansas State College, 1930; M.S., Iowa State College, 1933.

BEED, W. E., Entomology and Economic Zoology, 1935.
A.B., University of Nebraska, 1934; M.A., *ibid.*, 1935.

BEESON, CLEADYTH, Agricultural Economics, 1934.
A.B., Drake University, 1925.

BREAZEALE, D. F., Dairy Industry, 1932, 1929.
B.S., Iowa State College, 1928; M.S., *ibid.*, 1929.

BROWN, E. O., Botany and Plant Pathology, 1932.
B.S., University of Virginia, 1926; M.S., Iowa State College, 1932.

BUCHHOLTZ, W. F., Ph.D., Botany and Plant Pathology.

COX, GERTRUDE M., Statistics, 1933.
B.S., Iowa State College, 1929; M.S., *ibid*, 1931

DAVIS, GLEN N., Botany and Plant Pathology, 1930.
B.S., Colorado Agricultural College, 1929; M.S., Iowa State College, 1930; Ph.D., *ibid.*, 1934.

ECK, JOHN CLIFFORD, Animal Chemistry and Nutrition, 1935.
B.S., Montana State College, 1931; M.S., *ibid.*, 1932; Ph.D., University of Illinois, 1935.

EICKELBERG, E. W., Chemistry, 1933.
B.S., Iowa State College, 1933; M.S, *ibid*, 1935.

ERICKSON, E. L., Farm Crops, 1934.
B.S., Iowa State College, 1933.

FABRICIUS, N. E., B.S., M.S., Co-operator, Dairy Industry.

FELTON, GEORGE EDWIN, Plant Chemistry. 1935.
B.S., Iowa State College, 1931; M.S., *ibid.*, 1933; Ph.D., *ibid.*, 1935.

GOODSELL, WYLIE D., Rural Social Science and Economics, 1934.
B.S., University of Idaho, 1934; M.S., *ibid.*, 1934.

GREEN, W. E., Entomology and Economic Zoology, 1935.
B.S., Colorado State College, 1935.

GULL, PROCTOR, Farm Crops, 1934.
B.S., Iowa State College, 1933.

HANSBERRY, T. ROY, Entomology and Economic Zoology, 1934, 1933.
B.S., State College of Washington, 1931; M.S., *ibid.*, 1932.

HARRIMAN, L. A., Dairy Industry, 1934, 1929.
B.S., Iowa State College, 1925; M.S., *ibid.*, 1929; Ph.D., *ibid.*, 1934.

HENDERSON, W. J., Botany and Plant Pathology, 1928.
B.S., Colorado Agricultural College, 1927; M.S., *ibid.*, 1929.

HOSTETLER, P. H., B.S., Co-operator, Dairy Industry.

JUDAY, CLARENCE B., Farm Crops, 1935.
B.S. (E.E.), Purdue University, 1928; B.S.F., *ibid.*, 1935.

KENT, G. CLARENCE, B.A., Botany and Plant Pathology.

LANE, C. B., Dairy Industry, 1934, 1931.
B.S., Pennsylvania State College, 1929; M.S., Iowa State College, 1932; Ph.D., *ibid.*, 1934.

LAYTON, D. V., Co-operator, Agricultural Extension.

LEE, C. D., M.S., Co-operator, Veterinary Pathology.

LONG, HENRY F., Dairy Industry, 1934.
B.S., University of Maryland, 1931; M.S., Iowa State College, 1933.

MACDONALD, LUCILLE OAK, Household Equipment, 1935.
B.S., Iowa State College, 1934.

MALONE, CARL, Rural Social Science and Economics, 1930.
B.S., Iowa State College, 1923.

MICHAELIAN, M. B., Dairy Industry, 1932.
B.S., Iowa State College, 1929; Ph.D., *ibid.*, 1931.

MIGHELL, ALBERT, Rural Social Science and Economics, 1932, 1925.
B.S., University of Illinois, 1922; M.S., Iowa State College, 1924.

MILBY, T. T., Ph.D., Poultry Husbandry.

MINGES, PHILIP A., Pomology, 1935.
B.S., Michigan State College, 1934.

MORGAN, N. D., Vegetable Crops, 1930.
B.S., University of Arkansas, 1930; M.S., Iowa State College, 1933.

NIELSEN, VERNER H., Co-operator, Dairy Industry.

QUINTUS, PAUL E., Ph.D., Rural Social Science and Economics.

ROWE, J. A., Entomology and Economic Zoology, 1935.
B.S., Brigham Young University, 1929; M.S., University of Utah, 1931.

SCHICKELE, RAINER, Ph. D., Rural Social Science and Economics.

SOTH, LAUREN K., B.S., Co-operator, Rural Social Science and Economics.

STOUTEMYER, V. T., Pomology, 1930.
B.S., University of Illinois, 1928; M.S., Iowa State College, 1933.

WILSON, J. J., Botany and Plant Pathology, 1929.
B.S., Iowa State College, 1918; M.S., *ibid.*, 1929; Ph.D., *ibid.*, 1934.

RESEARCH GRADUATE ASSISTANTS

BRAUN, A. E., Botany and Plant Pathology, 1935.
B.S., University of Idaho, 1933; M.S., State College of Washington, 1935.

CRAVENS, WILLIAM W., Animal Chemistry and Nutrition, 1935.
B.S., University of Kentucky, 1935.

HARDEN, ORVAL, Rural Social Science and Economics, 1935.
B.S., University of Nebraska, 1933.

HARVEY, WILLIAM A., Botany and Plant Pathology, 1935.
A.B., University of Missouri, 1935.

HETZER, H. O., Ph.D., Co-operator, Genetics.

KLEMME, RANDALL T., Rural Social Science and Economics, 1935.
A.B., Grinnell College, 1932.

MARTIN, MARGARET E., Rural Social Science and Economics, 1935.
A.B., Barnard College, 1933; M.A., Columbia University, 1934.

NAGEL, C. M., Botany and Plant Pathology, 1934, 1932.
B.S., North Dakota State College, 1929; M.S., Iowa State College, 1932.

STIMSON, CLINTON R., Animal Chemistry and Nutrition, 1935.
B.S., Cornell University, 1935.

VAN PEURSEM, RALPH L., Animal Chemistry and Nutrition, 1935.
B.S., Iowa State College, 1928; A.B., Central College, 1929; M.S., Iowa State College, 1929.

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ARMSTRONG WILLIAMINA, B.S., M.S., Foods and Nutrition, 1935, 1934.

BARR, FLORENCE, B.S., M.S., Textiles and Clothing, 1934.

BODILY, HOWARD L., B.S., Soils, 1935.

BREWER, CARL R., B.A., Bacteriology, 1935.
BUCHANAN, BEN F., A.B., Co-operator, Chemistry, 1934.
DYME, HARRY C., B.S.A., Chemistry, 1935.
ENGLER, KYLE E., B.S. (E.E.), (Agr.E.), Agricultural Engineering, 1935.
FORD, BRUCE R., B.Sc.A., Bacteriology, 1935.
GROVE, LARRY C., B.S., M.S., Floriculture, 1933.
IRWIN, WILLIAM E., B.S., Poultry Husbandry, 1935.
JOHNSON, RUTH LAURA, B.S., Textiles and Clothing, 1934.
KASLOW, HAVEN DELOSS, B.S., Plant Chemistry, 1935.
LANHAM, FRANK B., B.S., Agricultural Engineering, 1935.
LEONARD, OLIVER A., B.S., Botany and Plant Pathology, 1935.
MARTIN, WILLIAM P., A.B., Soils, 1934.
MEUWISSEN, GALEN H., B.S., Dairy Industry, 1935.
MILLAR, HARVEY C., B.S., M.S., Soils, 1933.
MYERS, ELIZABETH, B.S., Foods and Nutrition, 1935.
NELSON, F. EUGENE, B.S., M.S., Dairy Industry, 1934.
PHILLIPPE, PAUL M., B.S., Soils, 1935.
REINMILLER, C. F., B.Sc., Meats, 1935.
RIGNEY, JACKSON A., B.S., Farm Crops, 1935.
ROGOSHESKI, ELIZABETH R., B.S., Foods and Nutrition, 1935.
SAILER, ALBERT J., B.S., Agricultural Engineering, 1935.
SEMENIUK, GEORGE, M.Sc., Botany and Plant Pathology, 1934.
SHOPTAW, LAVAN, B.S., B.A., M.S., Dairy Husbandry, 1935.
THORNE, D. WYNNE, B.S., M.S., Soils, 1933.
TULLY, WILBUR C., B.S.A., M.S.A., Poultry Husbandry, 1934.
UNDERBJERG, G. L. K., Dairy Husbandry, 1935.
WELLHAUSEN, EDWIN J., B.S., Genetics, 1933.
WELLMAN, HELEN E., B.S., Foods and Nutrition, 1935.
WIGGERT, WILBUR P., B.A., Bacteriology, 1935.
WILSON, HAROLD A., B.S., M.S., Soils, 1935.
YOUNKIN, STUART, B.S., Botany and Plant Pathology, 1935.

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WILLIAMS, NEIL K., B.S.A., Dairy Husbandry, 1935.

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KIMBALL, ALLEN H., M.S. . . . . Architectural Engineering
COX, PAUL E., B.S. (Cer.E.), Sc.D. . . . . Ceramic Engineering
SWEENEY, ORLAND R., Ph.D. . . . . Chemical and Mining Engineering
FULLER, ALMON H., C.E. . . . . Civil Engineering
COOVER, MERVIN S., E.E. . . . . Electrical Engineering
FULLER, GEORGE M., M.B.A. . . . . Industrial Economics
FABER, DANIEL C., E.E. . . . . Engineering Extension
PAINE, FRANK D., B.S. (E.E.) . . . . . General Engineering
HUNTER, WILLIAM L., M.A. . . . . Industrial Arts
CLEGHORN, MARK P., B.S. (E.E.), M.E. . . . . Mechanical Engineering
GILKEY, HERBERT J., M.S. . . . . Theoretical and Applied Mechanics

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RESEARCH ENGINEERS

AGG, THOMAS R., C.E. . . . . Highway Engineering
CLEGHORN, MARK P., B.S. (E.E.), M.E. . . . . Mechanical Engineering
COX, PAUL E., B.S. (Cer.E.), Sc.D. . . . . Ceramics
FULLER, GEORGE M., M.B.A. . . . . Industrial Economics
GILKEY, HERBERT J., M.S. . . . . Theoretical and Applied Mechanics
GRIFFITH, JOHN H. . . . . Engineering Materials, 1934, 1919
B.S. (C.E.), University of Wisconsin, 1893; M.S. (Math), *ibid.*, 1897.
COOVER, MERVIN S., E.E. . . . . Electrical Engineering
MARSTON, ANSON, C.E., D.Engr. . . . . Civil Engineering
LEVINE, MAX, Ph.D . . . . . Sanitary Bacteriology
SCHLICK, WILLIAM J. . . . . Drainage Engineering, 1914
B.C.E., Iowa State College, 1909; C.E., *ibid.*, 1914.
SWEENEY, ORLAND R., Ph.D. . . . . Chemical Engineering
WINFREY, ROBLEY . . Valuation and Cost Analysis, Bulletin Editor, 1922
B.S. (C.E.), Iowa State College, 1922; M.S., *ibid.*, 1926.

ASSOCIATE ENGINEERS

ARNOLD, LIONEL K. . . . . Chemical Engineering, 1933, 1925
A.B., Ellsworth College, 1920; B.S., Iowa State College, 1921; M.S., *ibid.*, 1926; Ph.D., *ibid.*, 1930.
BROWN, LYNN T., B.S. . . . . Automotive Engineering
DUNAGAN, WALTER M., M.S., C.E. . . . . Concrete Materials
HOLL, DIO L., Ph.D. . . . . Mathematics
MOYER, RALPH A., M.S., C.E. . . . . Highway Engineering
SPANGLER, MERLIN G. . . . . Structural Engineering, 1929, 1924.
B.S. (C.E.), Iowa State College, 1919; C.E., *ibid.*, 1926; M.S. *ibid.*, 1928.

ASSISTANT ENGINEERS

BROWN, ORAL A., Ph.D. . . . . Electrical Engineering
GALLIGAN, WILLIAM E., M.S. . . . . Sanitary Engineering
JENSEN, VERNON P., M.S. . . . . Theoretical and Applied Mechanics

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ERNST, GEORGE D., M.S. . . . . Engineering Materials
HESSLER, VICTOR P., Ph.D. . . . . Electrical Engineering
DACHTLER, W. C., B.S. . . . . Industrial Economics
MCELHINNEY, THOMAS ROBERT, . Chemical Engineering, 1935, Agricultural By-Products Co-operative Research.
B.S. (Chem.E.), Iowa State College, 1931.
NELSON, GUSSIE H., . Sanitary Chemistry, 1929, Agricultural By-Products Co-operative Research.
B.S. (Chem.E.), University of Iowa, 1923; M.S. (Chem.E.), *ibid.*, 1924.
PAUSTIAN, RAYMOND G., M.S. . . . . Highway Engineering

RESEARCH GRADUATE ASSISTANTS

GORE, LINN A., B.S. (M.E.) . . . . . Mechanical Engineering, 1934
MARTIN, SYLVAN C., B. of C.E., M.S. (Bact.) . Sanitary Engineering, 1934
ROLLMAN, WALTER F., B.S. (Chem.E.) M.S. . Chemical Engineering, 1934
HODGDON, FRANK B., B.S., S.M. (Chem.E.) . . Ceramic Engineering, 1934
VAUGHN, REESE H., A.B., M.S., Ph.D. . . Sanitary Bacteriology, 1934, 1930
HITCHCOCK, WILBUR, B.S. (C.E.) . . . . . Civil Engineering, 1935
JOHNSTON, JAMES ALVIN, B.S. (Chem.E.) . . . Chemical Engineering, 1935

MECHANICIAN

RIEDESEL, REUBEN C., ... Research Apparatus, 1912
B.S. (M.E.), Iowa State College, 1909.

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HERRICK, H. T., M.S., Ch.E., Chief, Industrial Farm Products Research Division, U. S. D. A.
JACOBS, P. BURKE, M.S., Ch.E., Chief of Ames Field Station Laboratory.
AGG, THOMAS R., B.S., C.E., Director of Iowa Engineering Experiment Station and Chief College Representative.
BUCHANAN, R. E., Ph.D., Dean of Graduate College and Director of Agricultural Experiment Station, Iowa State College.
FRILEY, CHARLES E., M.A., LL.D., Dean of Division of Industrial Science, Iowa State College.
SWEENEY, ORLAND R., Ph.D., Head of Department of Chemical Engineering, Iowa State College.

STAFF

JACOBS, PAUL BURKE, M.S., Ch.E., Senior Chemical Engineer in Charge.
STRAKA, ROBERT P., M.S., Assistant Bacteriologist.
WHITTEMORE, EDWARD R., Ph.D., Assistant Paper Technologist.
WEIHE, HERMAN DELIUS, M.S., Assistant Chemist.
NELSON, GUSSIE HARRIE, JR., M.S., Co-operator (Asst. Chem. Engr.)
OSBURN, OIVEN L., Ph.D., Co-operator (Asst. Bacteriologist).
MCELHINNEY, THOMAS ROBERT, B.S., Co-operator (Junior Chemical Engineer).

CONSULTANTS

SWEENEY, ORLAND R., Ph.D., Chemical Engineering.
LEVINE, MAX, Ph.D., Bacteriology.
WERKMAN, C. H., Ph.D., Bacteriology.
GALLIGAN, WILLIAM E., M.S., Sanitary Engineering.

INDUSTRIAL SCIENCE RESEARCH*

FRILEY, CHARLES E., A.M., LL.D. . . . . Director

RESEARCH PROFESSORS

BECKER, ELERY R.. D.Sc. . . . . Zoology
FOX, GERALD W., Ph.D. . . . . Physics
FULLER, GEORGE M., M.B.A. . . . . Economics
FULMER, ELLIS I., Ph.D. . . . . Chemistry
GILMAN, HENRY, Ph.D. . . . . Chemistry
HIXON, RALPH M., Ph.D. . . . . Chemistry
HOLL, DIO L., Ph.D. . . . . Mathematics
WERKMAN, CHESTER H., Ph.D. . . . . Bacteriology

RESEARCH ASSOCIATE PROFESSORS

CARR, PERCY H, Ph.D. . . . . Physics
LAUER, ALVHH R., Ph.D. . . . . Psychology

RESEARCH ASSISTANT PROFESSORS

HENDRICKSON, GEORGE, Ph.D. . . . . Zoology
MCCRACKEN, EARL C., Ph.D. . . . . Physics
OSBURN, OIVEN L. . . . . Bacteriology, 1931, 1925
B.S., Colorado State College, 1922; M.S., Iowa State College, 1930; Ph.D., *ibid.*, 1934.
WAKELEY, RAY E., Ph..D. . . . . Economics

RESEARCH ASSISTANTS

UNDERKOFLER, LELAND A., Ph.D. . . . . Chemistry, 1935

*In those cases where data relative to date of appointment and scholastic preparation are not given in the following list, the information will be found in the "Officers of Instruction" roster beginning on page 316.

RESEARCH FELLOWS

Anderson, Ariel, B.S.	Bacteriology,	1935
Bebb, Robert L.. B.A.	Chemistry,	1934
Bray, Willis J. Jr., B.S.	Chemistry,	1934
Claus, Wilbur S., M.S.	Chemistry,	1934
Dunning, John W., B.S.	Chemistry,	1935
Dykstra, Kenneth, A.B.	Chemistry,	1934
Elwood, Robert B., B.S.	Economics,	1935
Guymon, James F., B.S.	Chemistry,	1935
Landee, Frank A., B.S.	Chemistry,	1933
Mickelson, Milo N., B.S.	Bacteriology,	1935
Morehouse, Neal F., B.S.	Zoology,	1934
Morgal, Paul W., M.S.	Chemistry,	1935
Nelson, Joseph F., A.M.	Chemistry,	1934
Nelson, Milton E., M.S.	Bacteriology,	1931
Parker, Paul T., B.S.	Chemistry,	1933
Rook, Don H., B.A.	Chemistry,	1935
Salathiel, Richard, M.S.	Chemistry,	1935
Severson, G. M., B.S.	Chemistry,	1935
Stone, Robert W., B.S.	Bacteriology,	1935
Trauger, Don A., B.S.	Economics,	1935
Watson, Earl C., B.S.	Mathematics,	1935
Wendland, Ray, A.B.	Chemistry,	1933

RESEARCH SCHOLARS

Bradley, Chester W., M.S.	Chemistry,	1935
Burris, Albert, A.B.	Physics,	1934
Jacoby, Arthur L., B.S.	Chemistry,	1935
Johnson, LaVerne, B.S.	Psychology,	1934
Kirchner, J. G., B.S.	Chemistry,	1935
Kirkpatrick, Willard H., B.S.	Chemistry,	1933
McCoy, David O.. B.S.	Physics.	1934
Smith, E. Westley, A.M.	Chemistry,	1932
Turck, Joseph, B.S.	Chemistry,	1935
VanEss, Paul R., B.S.	Chemistry,	1935

STATISTICAL LABORATORY

Snedecor, George W., M.A.	Director, Research Professor, 1933,	1913
Brandt, A. E., Ph.D.	Research Assistant Professor, 1933,	1924
Cox, Gertrude M., M.S.	Research Assistant, 1933	

VETERINARY RESEARCH*

RESEARCH COUNCIL

STANGE, C. H., D.V.M. . . . . Director
MURRAY, CHARLES, Pe.B.. B.S., D.V.M. . . . . Vice Director
BERGMAN, H. D., D.V.M. . . . . Professor, Physiology
BENBROOK, E. A., V.M.D. . . . . Professor, Pathology
COVAULT, C. H., D.V.M. . . . . Professor, Medicine
FOUST, H. L., D.V.M. . . . . Professor, Anatomy
FOWLER, G. R., D.V.M. . . . . Professor. Surgery
WALSH. F. E., D.V.M. . . . . Professor, Obstetrics

ASSOCIATES

BIESTER, HARRY E., Associate Professor, Research, 1927, 1920
V.M.D., University of Pennsylvania, 1919.

MCNUTT, SAMUEL H., Associate Professor, Research, 1927, 1917
D.V.M., Iowa State College, 1917.

SCHWARTE, LOUIS H., Associate Professor, Research, 1935, 1925
B.S., Cornell University, 1918; M.S., *ibid.*, 1920; D.V.M., Iowa State College, 1928; Ph.D., *ibid.*, 1934.

EVELETH, DONALD FRANCIS, Associate Professor, Research, 1934, 1932
B.S., University of Califonia, 1928; M.A., *ibid.*, 1930; Ph.D., Western Reserve Medical College, 1932; D.V.M., Iowa State College, 1934.

LEE, CHESTER D., Assistant Professor, Research, 1933, 1927
D.V.M , Iowa State College, 1927; M.S., *ibid.*, 1932.

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*In those cases where data relative to date of appointment and scholastic preparation are not given in the following list, the information will be found in "Officers of Instruction" roster beginning on page 316.

Extension

EXTENSION IN AGRICULTURE AND HOME ECONOMICS

BLISS, R. K. . . . . Director, 1914, 1906
B.S.A., Iowa State College, 1905.

TAFF, P. C. . . . . Assistant Director, 1917, 1912
B.S. (Agron.), Iowa State College, 1913.

MCDONALD, MURL . . . . . Assistant Director, 1918, 1911
B.S.A., Iowa State College, 1911.

HARPER, W. L. . . . . Secretary, 1920, 1911

STAFF

ADAMS, GLADYS . . . Extension Instructor of Home Economics, 1935, 1929
B.S., Iowa State College, 1928.

ALLBAUGH, L. G. . Ext. Assoc. Professor of Farm Management, 1922, 1918
B.S. (F.M.), Iowa State College, 1919; M.S., *ibid.*, 1928.

ANDERSON, MAE . . . Extension Instructor of Home Economics, 1935, 1930
B.S., Iowa State College, 1930.

ARNOLD, FLOYD J. . . . . Ext. Asst. in Dairy Husbandry, 1927
B.S., Iowa State College, 1926.

ARTHUR, I. W. . . . . Ext. Asst. Professor of Marketing, 1927, 1915
B.S. (A.H.), Iowa State College, 1916; M.S., *ibid.*, 1927.

BAKKE, MRS. JOSEPHINE . . . . . In Charge of Girls Club Work, 1920
A.B., Washington State College, 1919.

BARKER. MRS. EDITH . . . . . Agent in Club Work, 1923, 1917

BENTLEY, R. C. . . . . Ext. Asst. Professor of Marketing, 1934, 1928
B.S., North Dakota Agricultural College, 1923; M.S., *ibid.*, 1924.

BERESFORD, REX . . . . . Ext. Professor of Animal Husbandry, 1916
B.S. (A.H.), Iowa State College, 1911.

BOATMAN, J. L. . . . . Ext. Professor of Soils, 1925, 1921
B.S., Iowa State College, 1921.

BOUSKA, FRANK J. . . . . Ext. Asst. in Dairy Industries, 1935
B.S., Iowa State College, 1934.

BROWN, E. O. . . . . Seed Analyst, 1932
B.S., University of Virginia, 1927; M.S., Iowa State College, 1932.

BROWN, RUTH WESTER . . . . Instructor of Home Economics, 1934, 1926
B.S. Iowa State College, 1925.

CADY, E. L. . . . . Ext. Asst. Professor of Marketing, 1929, 1922
B.S. (Ag.), University of Missouri, 1921; M.S., Iowa State College, 1923; Ph.D., *ibid.*, 1933.

CESSNA, RUTH . . . Ext. Asst. Professor of Home Economics, 1924, 1917
B.S., Iowa State College, 1914; M.A., Columbia University, 1917.

CHAPMAN, GRANT . . . . . Supt. of Tours, 1923, 1917

CLARK, FRED . . . . . District Extension Agent, 1928, 1916
B.S. (A.H.), Iowa State College, 1916.

CROMER, PAUL . . . . . Ext. Asst. in Dairy Industries, 1934, 1933
B.S., Iowa State College, 1920.

COMBS, L. R. . . . . Extension Editor, 1929, 1928
B.S. (Ind. Journ.), Kansas State College, 1925.

COWDEN, J. M. . . . . Ext. Asst. Professor of Marketing, 1927
B.S., Iowa State College, 1925.

DAVIS, GLEN N. . . . Ext. Asst. Professor of Plant Diseases, 1934, 1929
B.S., Colorado Agricultural College, 1929; M.S., Iowa State College, 1930; Ph.D., *ibid.*, 1934.

DECKER, GEO. C. . . . . Ext. Instructor, Injurious Insects. 1934, 1927
B.S., Iowa State College, 1924; M.S., *ibid.*, 1927; Ph.D., *ibid.*, 1930.

DYAS, E. S. . . . Ext. Asst. Professor of Farm Crops and Soils, 1923, 1916
B.S. Iowa State College, 1920.

EDGECOMBE, S. M. . . . . Ext. Asst. Professor of Horticulture, 1935
B.S.A.. University of Manitoba, 1930; M.S., Iowa State College, 1931.

EICHLING, H. L. . . . . District Extension Agent, 1922, 1911
B.S., Iowa State College, 1911.

ELLIS, MRS. SARAH PORTER . . . Ext. Professor of Home Economics, 1934
B.S., University of Wisconsin, 1916.

FITCH, C. L. . . . . Ext. Professor of Vegetables, 1913
M.A., Grinnell College, 1913.

FITZSIMMONS, J. R. . . . Ext. Professor of Landscape Architecture, 1924
B.S., Colorado Agricultural College, 1921; M.L.A., Harvard University, 1924.

FOLKEN, HERBERT . . . . . Ext. Asst. in Farm Management, 1935
B.S., Iowa State College, 1931.

FORBES, FLORENCE . . . . . Agent in Club Work, 1926, 1923
B.S., Iowa State College, 1925.

*GALLOWAY, J. C. . . . Ext. Assoc. Professor of Farm Management. 1918
B.S. (A.H.), Iowa State College, 1916.

GANNON, FANNIE . . . . Ext. Instructor of Home Economics, 1926, 1919
B.S., Iowa State College, 1921.

GARNER, IRMA . . . . . Ext. Instructor of Home Economics, 1928
B.S., Iowa State College, 1926; M.S., *ibid.*, 1928.

GRAFF, E. F. . . . . District Extension Agent, 1920, 1917
B.S., Iowa State College, 1917.

GREGG, MRS. MARY . . Ext. Asst. Professor of Home Economics, 1926, 1917

GRIFFITH, W. I. . . . . Ext. Asst. Professor of Visual Instruction, 1925
B.S., Iowa State College, 1899.

HANSBERRY, T. ROY . . . . Ext. Instructor, Injurious Insects, 1934, 1933
B.S., Washington State College, 1931; M.S., *ibid.*, 1932.

HAUSER, M. A. . . . . Ext. Professor of Farm Crops and Soils, 1916, 1906

HOLSINGER, C. V. . . . . Ext. Professor of Horticulture, 1918
B.S., Kansas State College, 1895.

JOHNSTON, FLOYD . . . . Ext. Assoc. Professor of Dairy Husbandry, 1928
B.S., Iowa State College, 1924.

JONES, MRS. ALMA . . Ext. Asst. Professor of Home Economics, 1925, 1922
B.S., Iowa State College, 1922; M.S., Columbia University, 1925.

KNOWLES, NEALE S. . . . . Ext. Professor of Home Economics, 1907

KOOSER, HAROLD . . . . . Ext. Asst. Visual Instruction, 1924
B.S., Iowa State College, 1923.

LARSON, MRS. N. MAY . Ext. Asst. Professor of Home Economics, 1929. 1918
B.S., University of Wisconsin, 1917.

*Absent on leave.

LAYTON, DUKE V. . . . . Ext. Instructor of Plant Diseases, 1931, 1927
B.S., New Mexico Agricultural College, 1926; M.S., Iowa State College, 1929.

LEWIS, JOHN R. . . . . Radio Operator, 1934
B.S., Iowa State College, 1931.

LOYD, GLENNON . . . . . Asst. Extension Editor, 1934
B.S., Iowa State College, 1934.

MCDONALD, C. W. . . Ext. Assoc. Professor of Animal Husbandry, 1919
B.S., Pennsylvania State College, 1917; M.S., *ibid.*, 1919.

MERRILL, J. W. . . . . District Extension Agent, 1924, 1909
B.S.A., Iowa State College, 1909.

MORRIS, N. A. . . . Ext. Asst. Professor of Landscape Architecture, 1934
B.S., Iowa State College, 1930.

NUTTY, LEE T. . . . . District Extension Agent, 1929, 1917
B.S. (A.H.), Iowa State College, 1917.

PADDOCK, F. B. . . . . State Apiarist, 1919
B.S., Colorado Agricultural College, 1911; M.S., Ohio State University, 1915.

PETERSON, ANNETTE . . . . . Ext. Instructor of Home Economics, 1930
B.S., Iowa State College, 1930.

PETERSON, ELIZABETH . . Ext. Instructor of Home Economics, 1935, 1928
B.S., Iowa State College, 1925.

PORTER, R. H. . . . . Ext. Professor of Plant Pathology, 1931, 1919
B.S., Iowa State College, 1918; M.S., *ibid.*, 1920; Ph.D., *ibid.*, 1930.

QUAIFE. E. L. . . . . Ext. Assoc. Professor of Animal Husbandry, 1917
B.S., Iowa State College, 1911.

QUIST, J. S. . . . . Agent in Club Work, 1921, 1918
B.S., Iowa State College, 1917.

RAMSEY, G. R. . . . . Ext. Asst. Professor of Forestry, 1934
B.S., Washington State College, 1929; M.S., *ibid.*, 1931.

REED, FRANK P. . . . . Agent in Club Work, 1917, 1911
LL.B., Drake University, 1896.

ROBINSON, JOE L. . . . . Ext. Assoc. Professor of Soils, 1934, 1920
B.S., Oklahoma Agricultural and Mechanical College, 1916; M.S., Iowa State College, 1918; Ph.D., *ibid.*, 1933.

ROBOTKA, FRANK . . . . Ext. Assoc. Professor of Marketing, 1927, 1920
B.S., University of Wisconsin, 1915; M.S., University of Minnesota, 1921.

RUDNICK, A. W. . . . . Ext. Professor of Dairy Industries, 1918, 1913
B.S., Iowa State College, 1910.

SCOTT, THOMAS, J. . . . . Wildlife Specialist, 1935
B.S., Iowa State College, 1935.

SHIPTON, HOWARD . . . . . Instructor of Apiary Work, 1926

SCHULTZ, E. N. Asst. Prof. in Charge Rural Young Peoples Work, 1935, 1926
B.S., Iowa State College, 1924; M.S., University of Minnesota, 1929.

SIMPSON, RUBY . . . . . Ext. Instructor of Home Economics, 1935
B.S., Nebraska University, 1924; M.S., Iowa State College, 1930.

SIMMONS, DOROTHY . . . Ext. Instructor of Home Economics, 1935, 1934
B.S., Iowa State College, 1931.

SOTH, LAUREN . . . . Ext. Instructor of Farm Management, 1934, 1932
B.S., Iowa State College, 1932.

STACY, W. H. . . Ext. Assoc. Professor of Rural Organization, 1922, 1917
B.S., Iowa State College, 1917; M.S., Cornell University, 1922.

STOUDER, K. W. . . . . Ext. Professor of Veterinary Medicine, 1913
D.V.M., Iowa State College, 1905.

SWINNEY, HELEN . . . . . Ext. Instructor of Home Economics, 1929
B.S., Iowa State College, 1927.

THOMPSON, SAM H. . . . . Ext. Professor of Marketing, 1921, 1914
B.S., University of Minnesota, 1914; M.S., Iowa State College, 1923.

VERNON, WM. M. . . . . Ext. Assoc. Professor of Poultry, 1928, 1920
B.S., North Carolina State College, 1919; M.S., Iowa State College, 1923.

VIRTUE, BYRON . . Ext. Instructor of Agricultural Engineering, 1933, 1931
B.S., Iowa State College, 1931; M.S., *ibid.*, 1932.

VAN VLACK, C. H. . Ext. Assoc. Professor of Agricultural Engineering, 1934
B.S., Iowa State College, 1929.

WAKELEY, RAY E. . . Ext. Asst. Professor of Rural Sociology, 1934, 1930
B.S., Pennsylvania State College, 1917; M.S., University of Wisconsin, 1924; Ph.D., Cornell University, 1928.

WEAVER, RUSSELL . . . . . Ext. Asst. in Dairy Industries, 1932
B.S., Iowa State College, 1930.

WESTER, KARL . . . . . Ext. Asst. in Dairy Industries, 1932
B.S., Iowa State College, 1930.

WHITFIELD, W. R. . . . . Ext. Asst. in Poultry Husbandry, 1927
B.S., University of Nebraska, 1926.

WILSON, L. MILDRED . . . . . Ext. Instructor of Home Economics, 1925
B.S., Iowa State College, 1924.

WOODRUFF, J. A. . . . . Ext. Instructor of Agricultural Education, 1927
B.Di., Iowa State Teachers College, 1901; M.Di., *ibid.*, 1904; B.S., Iowa State College, 1933.

WOOLFRIES, ANDY . . . . . Radio Announcer, 1921

WORKMAN, NORA . . Ext. Asst. Professor of Home Economics, 1925, 1918
B.S., Iowa State College, 1916.

WORTHINGTON, A. D. . . Ext. Asst. Professor, Injurious Insects, 1932, 1923
B.S., Mississippi State College, 1927.

COUNTY AGENTS

ZELLERS, WALTER M. . . . . Adair, Greenfield
B.S., Iowa State College, 1929.

SPARBOE, WM. H. . . . . Adams, Corning
B.S., Iowa State College, 1929.

O'RILEY, FRED C. . . . . Allamakee, Waukon
B.S., Iowa State College, 1926.

BOWDISH, LEO . . . . . Appanoose, Centerville
B.S., Iowa State College, 1929.

MCGINNIS, E. M. . . . . Audubon, Audubon

GREEN, JAMES C. . . . . Benton, Vinton
B.S., Iowa State College, 1923.

BARGER, PAUL . . . . . Black Hawk, Waterloo
B.S., Iowa State College, 1926.

WALKER, HARLEY . . . . . Boone, Boone
B.S., Iowa State College, 1914.

OFFRINGA, D. D. . . . . Bremer, Waverly
B.S., Iowa State College, 1922.

WESTERN, D. E. . . . . Buchanan, Independance
B.S., Iowa State College, 1929.

GUNNERSON, G. L. . . . . Buena Vista, Storm Lake
B.S., Iowa State College, 1917.

VAN WERT, J. S. . . . . Butler, Allison
B.S., Iowa State College, 1933.

DARBYSHIRE, WM. . . . . Calhoun, Rockwell City
B.S., Iowa State College, 1928.

KLOSER, FRANCIS J. . . . . Carroll, Carroll
B.S., Iowa State College, 1918.

KNAUPP, PAUL . . . . . Cass, Atlantic
B.S., Iowa State College, 1933.

SEEDS, MORRELL . . . . . Cedar, Tipton
B.S., Iowa State College, 1921.

OLSON, M. E. . . . . Cerro Gordo, Mason City
B.S., (Agron.), Iowa State College, 1914.

TURNER, C. G. . . . . Cherokee, Cherokee
B.S., Iowa State College, 1927.

THUROW, MELVIN . . . . . Chickasaw, New Hampton
B.S., Iowa State College, 1931.

WHIRRETT, KENNETH . . . . . Clarke, Osceola
B.S., Iowa State College, 1921.

BUSENBARK, PAUL . . . . . Clay, Spencer
B.S., Iowa State College, 1917.

COMBS, A. R. . . . . Clayton, Elkader
B.S., Iowa State College, 1915.

LACY, MYRON D. . . . . Clinton, DeWitt
B.S., Texas Agricultural and Mechanical College, 1930; M.S., Iowa State College, 1931.

JOHNSON, PAUL A. . . . . Crawford, Denison
B.S., Iowa State College, 1913.

FISH, DONALD . . . . . Dallas, Adel
B. of Bus. Adm., University of Minnesota, 1932.

OGG, WALLACE . . . . . Davis, Bloomfield
B.S., Iowa State College, 1931.

MILLER, ARVID . . . . . Decatur, Leon
B.S., Iowa State College, 1934.

HUEHN, KERMITH . . . . . Delaware, Manchester
B.S., Iowa State College, 1928.

COTTON, C. C. . . . . Des Moines, Burlington
B.S., Purdue University, 1916; M.S., Iowa State College, 1923.

RANK, LOUIS . . . . . Dickinson, Spirit Lake
B.S., Iowa State College, 1928.

KERRIGAN, FRANK R. . . . . Dubuque, Dubuque
B.S., Iowa State College, 1916.

BALKEMA, MARION . . . . . Emmet, Estherville
B.S., Iowa State College, 1927.

MCELROY, PAUL . . . . . Fayette, Fayette
B.S., Iowa State College, 1931.

BROWN, WM. H. . . . . Floyd, Charles City
B.S., Iowa State College, 1931.

HOWELL, MANNING . . . . . Franklin, Hampton
B.S., Iowa State College, 1928.

SCHNEIDER, FREDERICK . . . . . Fremont, Sidney
B.S., Iowa State College, 1932.

MARKEN, A. J., ... Greene, Jefferson
B.S., Iowa State College, 1932.

PLAGER, L. W. . . . . Grundy, Grundy Center

WILSON, E. PAUL . . . . . Guthrie, Guhtrie Center
B.S., Iowa State College, 1926.

NICHOLS, H. M. . . . . Hamilton, Webster City
B.S., Iowa State College, 1918.

OBERHAUSER, S. J. . . . . Hancock, Garner
B.S., Iowa State College, 1907.

EYRE, WALTER B. . . . . Hardin, Eldora
B.S., Iowa State College, 1926.

HANSON, F. B. . . . . Harrison, Logan
B.S., Iowa State College, 1913.

BEATH, LEN R. . . . . Henry, Mt. Pleasant
B.S., Iowa State College, 1923.

PAYNE, PAUL N. . . . . Howard, Cresco
B.S., Iowa State College, 1918.

GROVES, DONALD . . . . . Humboldt, Humboldt
B.S., Iowa State College, 1932.

BURNS, M. H. . . . . Ida, Ida Grove
B.S., Iowa State College, 1925.

ZENTMIRE, D. H. . . . . Iowa, Marengo
B.S., Iowa State College, 1913.

KRAUSE, F. E. . . . . Jackson, Maquoketa
B.S., Iowa State College, 1930.

ZAHN, LEONARD . . . . . Jasper, Newton
B.S., Iowa State College, 1930.

LINDSAY, R. G. . . . . Jefferson, Fairfield

GARDNER, EMMETT . . . . . Johnson, Iowa City

SMITH, CARL R. . . . . Jones, Anamosa
B.S., Iowa State College, 1931.

SOULTS, MAURICE W. . . . . Keokuk, Sigourney
B.S., Iowa State College, 1930.

BROWN, A. L. . . . . Kossuth, Algona
B.S., Iowa State College, 1922.

REDFERN, CARROLL . . . . . Lee, Donnellson
B.S., Iowa State College, 1929.

DILLON, GEORGE . . . . . Linn, Cedar Rapids
B.S., University of Wisconsin, 1914.

PETERSON, EARL D. . . . . Louisa, Wapello
B.S., Iowa State College, 1931.

MARTIN, STERLING . . . . . Lucas, Chariton

COVERDALE, R. J. . . . . Lyon, Rock Rapids
B.S., Iowa State College, 1933.

BENSON, J. A. . . . . Madison, Winterset
B.S., Iowa State College, 1927.

WOODFORD, RAYMOND E. . . . . Mahaska, Oskaloosa
B.S., Iowa State College, 1918.

BROWN, WALTER . . . . . Marion, Knoxville
B.S., Iowa State College, 1923.

PETERSON. H. J. . . . . Marshall, Marshalltown
B.S., Iowa State College, 1925.

KILPATRICK, B. M. . . . . Mills, Malvern
B.S., Iowa State College, 1932.

FABRICIUS, MARTIN . . . . . Mitchell, Osage
B.S., Iowa State College, 1932.

MORRISON, E. E. . . . . Monona, Onawa
B.S., Iowa State College, 1930.

HAMILTON. HOWARD A. . . . . Monroe, Albia
B.S., Iowa State College, 1932.

ANDERSON, VINCENT . . . . . Montgomery, Red Oak
B.S., Iowa State College, 1924.

RYLANDER, CARL . . . . . Muscatine, Muscatine
B.S., Iowa State College, 1927.

BIRLINGMAIR, M. G. . . . . O'Brien, Primghar
B.S., Iowa State College, 1922.

NELSON, PAUL . . . . . Osceola, Sibley
B.S., Iowa State College, 1922.

GRISWOLD, DON G. . . . . Page, Clarinda
B.S.A., Iowa State College, 1909.

HOFFMAN, RANDALL . . . . . Palo Alto, Emmetsburg

THOMPSON, CLARENCE . . . . . Plymouth, LeMars
B.S., Iowa State College, 1928.

WILLETT, HOWARD C. . . . . Pocahontas, Pocahontas
B.S., Iowa State College, 1933.

REYNOLDS, FRANK . . . . . Polk, Des Moines
B.S., Iowa State College, 1930.

LEINBACH, ROGER . . . . . Pottawattamie, E., Oakland
B.S., Iowa State College, 1934.

BERQUIST, REUBEN . . . . . Pottawattamie, W.. Council Bluffs
B.S., Iowa State College, 1929.

MILLER, HAROLD F. . . . . Poweshiek, Brooklyn
B.S., Iowa State College, 1915.

BLISS, J. A. . . . . Ringgold, Mt. Ayr

LITTLEFIELD, KENNETH . . . . . Sac, Sac City
B.S., Iowa State College, 1930.

COMBS, ROBERT . . . . . Scott, Davenport

ROSENFELD, GEO. A. . . . . Shelby, Harlan
B.S., Iowa State College, 1926.

NICOL, H. S. . . . . Sioux, Orange City
B.S., Iowa State College, 1928.

MONTGOMERY, H. J. . . . . Story, Nevada
B.S., Iowa State College, 1920.

BYRAM, BURNS . . . . . Tama, Toledo
B.S., Iowa State College, 1921.

ISAAC, T. H. . . . . Taylor, Bedford

PARSONS, A. P. . . . . Union, Creston
B.S., Iowa State College, 1926.

SECOR, A. J. . . . . Van Buren, Keosauqua
B.S.A., Iowa State College, 1905.

HAZEN, GLENN . . . . . Wapello, Ottumwa
B.S., Iowa State College, 1919.

NICKLE, L. J. . . . . Warren, Indianola
ROUDABUSH, W. J. . . . . Washington, Washington
B.S., Iowa State College, 1920.
JUDD, C. E. . . . . Wayne, Corydon
B.S., Iowa State College, 1932.
ANDERSON, GLENN . . . . . Webster, Ft. Dodge
B.S., Iowa State College, 1930.
MECHEM, CLARK . . . . . Winnebago, Thompson
B.S., Iowa State College, 1927.
WEIGLE, EVERETT . . . . . Winneshiek, Decorah
B.S., Iowa State College, 1928.
HAYES, H. M. . . . . Woodbury, Sioux City
B.S., Purdue University, 1922.
NELSON, R. T. . . . . Worth, Northwood
B.S., Iowa State College, 1925.
ADAMSON, RALPH W. . . . . Wright, Clarion
B.S., Iowa State College, 1924.

HOME DEMONSTRATION AGENTS

KNUPP, JENNIE NELSON . . . . . Benton, Vinton
B.S., Iowa State College, 1928.
DILGER, HELENA . . . . . Black Hawk, Waterloo
B.A., University of Iowa, 1925.
WILLIAMS, FLORENCE . . . . . Dallas, Adel
B.S,, Iowa State College, 1931.
LINDGREN, ROBERTA THOMPSON . . . . . Davis, Bloomfield
B.S., Iowa State College, 1932.
PFEIL, MARGARETTE . . . . . Emmet, Estherville
B.S., Iowa State College, 1929.
BLANK, CLARA . . . . . Franklin, Hampton
B.S., Iowa State College, 1932.
COCHRAN, LUCILE LACOCK . . . . . Hardin, Eldora
B.A., University of Iowa, 1925.
WILSON, ALEENE . . . . . Linn, Cedar Rapids
B.S., Iowa State College, 1929.
PHIPPS, MABEL . . . . . Madison, Winterset
B.S., Iowa State College, 1919.
HORLACHER, ELIZABETH . . . . . Marshall, Marsralltown
B.S., Iowa State College, 1933.
HOLLAND, CARRIE . . . . . Muscatine, Muscatine
B.S., Iowa State College, 1933.
COLBY, ELIZABETH . . . . . O'Brien, Primghar
B.S., Iowa State College, 1934.
WINGERT, DOROTHY . . . . . Scott, Davenport
B.S., Iowa State College, 1930.
MACUMBER, IRIS . . . . . Sioux, Orange City
B.S., Iowa State College, 1930.
HUFFMAN, EDITH MOSS . . . . . Tama, Toledo
B.S., University of Nebaska, 1923.
EVERETT, ESTHER . . . . . Webster, Ft. Dodge
B.S., Iowa State College, 1933.

BAKKE, IDELIA . . . . . W. Pottawatamie, Council Bluffs
B.S., Iowa State College, 1930.

LOUGHRAN, ELLA . . . . . Woodbury, Sioux City
B.S., Iowa State College, 1921.

CHOLLETT, MARJORIE . . Cerro Gordo, Mason City; Hancock, Garner
B.S., Iowa State College, 1932.

NIEMOLLER-SANDS, ANN . . . Boone, Boone; Hamilton, Webster City
B.S., Iowa State College, 1928.

TRINDLE, PAULINE . . Calhoun, Rockwell City; Humboldt, Humboldt
B.S., Iowa State College, 1927.

SIMS, PEARL . . . . . Cherokee, Cherokee; Plymouth, LeMars
B.S., Iowa State College, 1918.

LEWIS, LILLIAN . . . . . Fayette, Fayette
B.S., Iowa State College, 1929.

WOOD, MARY . . . . Guthrie, Guthrie Center; Audubon, Audubon
B.S., Iowa State College, 1935.

SCOTT, LOUISE A. . . . . Shelby, Harlan; E. Pottawatamie, Oakland
B.S., Iowa State Teachers College, 1923.

MACUMBER, WINIFRED . . Winnebago, Thompson; Worth, Northwood
A.B., Penn College, 1929.

WERTS, MARGARET . . . . . Adair, Greenfield; Cass, Atlantic
B.S., Iowa State College, 1933.

COUNTY CLUB AGENTS

HAGER, R. F. . . . . Adair, Greenfield
B.S., Iowa State College, 1931.

KELSEY, PEARL R. . . . . Appanoose, Centerville
Iowa State College, 2-year course.

SCOTT, THOMAS . . . . . Black Hawk, Waterloo
B.S., Iowa State College, 1935.

IRWIN, DALE E. . . . . Buchanan, Independence
B.S., Iowa State College, 1932.

LONGSTREET, JOHN . . . . . Cass, Atlantic
B.S., Iowa State College, 1932.

WANGSNESS, M. C. . . . . Clarke, Osceola
B.S., Iowa State College, 1932.

BURNISON, IVAN H. . . . . Decatur, Leon
B.S., Iowa State College, 1925.

WALKER, W. HAROLD . . . . . Franklin, Hampton
B.S., Iowa State College, 1935.

BROWN, LOREN . . . . . Greene, Jefferson
B.S., Iowa State College, 1934.

BOOTH, DWIGHT I. . . . . Harrison, Logan
B.S., Iowa State College, 1934.

DAVISON, RICHARD E. . . . . Henry, Mt. Pleasant
B.S., Iowa State College, 1933.

ASHBY, R. W. . . . . Iowa, Marengo
B.S., Iowa State College, 1928.

CLOUGH. JOHN B. . . . . Jasper, Newton
B.S., Iowa State College, 1934.

INGLE, HAROLD . . . . . Linn, Cedar Rapids
B.S., Iowa State College, 1933.

SODER, KEATS E. . . . . Madison, Winterset
B.S., Iowa State College, 1933.

ZELLER, MERVIN L. . . . . Marion, Knoxville
B.S., Iowa State College, 1934.

JOHNSON, J. CLIFFORD . . . . . Page, Clarinda
B.S., Iowa State College, 1932.

OWEN, THOMAS S. . . . . Polk, Des Moines
B.S., Iowa State College, 1930.

DAVIE, ROBERT M. . . . . Taylor, Bedford
Iowa State College, 2-year course.

EDWARDS, IRVIN . . . . . Scott, Davenport
B.S., Iowa State College, 1934.

GOELDNER, MELVIN H. . . . . Story, Nevada
B.S., Iowa State College, 1922.

OLSON, ROY E. . . . . Tama, Toledo
B.S., Iowa State College, 1934.

SLEMMONS, G. H. . . . . Van Buren, Keosaqua
B.S., Iowa State College, 1930.

TALCOTT, CHARLES . . . . . Webster, Ft. Dodge
B.S., Iowa State College, 1933.

GEIGER, HARLAN . . . . . Fayette, Fayette
B.S., Iowa State College, 1935.

SOMERS, MERLE E. . . . . Warren, Indianola
B.S., Iowa State College, 1923.

DODGE, HOWARD J. . . . . Audubon, Audubon; Shelby, Harlan
B.S., Iowa State College, 1934.

FEE. WILLARD . . . . . Bremer, Waverly; Butler, Allison
B.S., Iowa State College, 1933.

HENDERSON, CHARLES R. . E. Pottawatamie, Oakland; Montgomery, Red Oak
B.S., Iowa State College, 1933.

STANDLEY, DEAN . . . . . Hamilton, Webster City; Wright, Clarion
B.S., Iowa State College, 1935.

ROGERS, EDGAR C. . . . . Muscatine, Muscatine; Louisa, Wapello
B.S., Iowa State College, 1928.

WILSON, ADRIAN M. . W. Pottawatamie, Council Bluffs; Mills, Malvern
B.S., Iowa State College, 1931.

ASSISTANT COUNTY AGENT

WALLACE, J. J. . . . . Four County Farm Management, Cedar Rapids
B.S., Iowa State College, 1916.

ENGINEERING EXTENSION*

FABER, DANIEL C., E.E. . . . . Director

BAIRD, EARL S. . . . . Associate Professor, Industrial Management, 1924
B.S., Iowa State College, 1926; M.S.,*ibib.*, 1932.

*In those cases where data relative to date of appointment and scholastic preparation are not given in the following list, the information will be found in the "Officers of Instruction" roster beginning on page 316.

GRIFFITH, W. I. . . . . Associate Professor, Radio Broadcasting, 1925
B.S. (Agr.), Iowa State College, 1899; M.Di., Iowa State Teachers College, 1905.

MURPHY, LINDON J. . Associate Professor, Municipal Engineer, 1926, 1921
B.S., Iowa State College, 1921; M.S., *ibib.*, 1924; C.E., *ibid.*, 1926.

MAHONE, LESLIE W. . . . Assistant Professor, Civil Engineer, 1930, 1921
B.S. (C.E.), Iowa State College, 1920; M.S., *ibid.*, 1927.

HOLBROOK, ROYAL H. . . . . Combustion Engineer, 1919

KOOSER, HEROLD L. . . Assistant Professor, Visual Instruction, 1933, 1924
B.S, Iowa State College, 1923.

Alumni Visitors

The first person named serves for five years, the second for four years, etc.

Agricultural Economics

Byron G. Allen, '32
Mitchell W. Sprole, '25
R. M. Evans, '13
George W. Patterson, '09
Leslie M. Carl, '14, '22

Agricultural Engineering

Stanley Madill, '27
W. G. Kaiser, '14, '19
L. J. Fletcher, '15
Leo Ahart, '17, '29
Robert A. Norton, '24

Agronomy

Ben Walker, '13, '24
N. C. Kinnick, '16
M. E. Olson, '14, '16
Merritt Greene, Jr., '05, '15
W. H. Brenton, '20

Animal Husbandry

A. H. Ward, '18, '24
Lester Gillette, '13
V. B. Hamilton, '21
Clarence Hill, '24
R. C. Pollock, '13, '21

Chemistry

Lillian Storms, '08
George Judisch
Lyman C. Craig, '28, '31
F. F. Sherwood, '25
Anson Hayes, '17

Civil Engineering

Boyne Platt, '23
Clarence Moriarity, '12, '26
L. L. Hidinger, '06, '11
F. R. White, '07
O. W. Crowley, '13

Dairy Industry

G. H. Tellier, '10
R. O. Storvick, '25
Ralph Bartlett, '25
Paul Crowley, '10
E. S. Estel, '10, '20

Electrical Engineering

W. D. Hardaway, '19
H. B. McElyea, '09, '29
Floyd Beaty, '12
E. O. Shreve, '04
Paul Clapp, '13, '25

Forestry

DeWitt Nelson, '25
E. A. Sherman, '96, '27, '28
Shirley W. Allen, '09, '29
T. R. Truax, '12, '19

Home Economics

Winifred Sinnard Jones, '21
Genevieve Callahan, '20
Lillian Storms, '08
Katherine Goeppinger, '24
Mable Campbell, '05

Horticulture

Robert M. Clark, '15
L. S. Goode, '18
Lindley B. Hoopes, '17
R. S. Herrick, '21

Industrial Arts

Frederic W. Bohning, '33
Ross C. Cramlet, '32
Wayne M. Judy, '32
John J. Voth, '33
Sam Etzel, '32

Landscape Architecture

Kenneth F. Mitchell, '29
A. C. Kuehl, '24
A. M. Husted, '21, '28
Sanford Hill, '29
L. L. Blundell, '24

Mathematics

VIRGIL SNYDER, '89
ARTHUR M. WAHL, '25
DWIGHT F. GUNDER, '25, '26
DIRK DEKKER, '25, '26
J. VAN S. LONGENECKER, '23

Mechanical Engineering

F. T. WHITING, '13
I. R. SMITH, '05
J. C. AUSTIN, '02, '10
GEORGE W. MORRISON, '10
W. M. WILSON, '00

Technical Journalism

JEAN GUTHRIE DUMONT, '31
FRANK M. RECK, '25
M. E. CRAMER, '27
A. W. LOOMIS, '28
KIRK FOX, '20

Veterinary Medicine

F. F. PARKER, '00
C. J. SCOTT, '08
JOHN PATTERSON, '12
N. L. NELSON, '11
C. W. DEMING, '00

Vocational Education

C. M. BARTRUG, '23, '27
E. M. TANRUTHER, '24
PAUL A. TROEGER, '21
NEIL E. JOHNSTON, '24

Zoology and Entomology

BEN WAGNER, '25
E. W. LAAKE, '33
FLOY HORN, '30
GEORGE M. LIST, '31
WALLACE HARLAN LONGWORTH, '24

Index

The College

The Iowa State College of Agriculture and Mechanic Arts conducts work in five major fields:

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VETERINARY MEDICINE

The Graduate College conducts research and instruction in all these five fields.

Four-year, five-year, and six-year collegiate curricula are offered in different divisions of the College. Non-collegiate curricula are offered in agriculture. Summer sessions include graduate and collegiate work. Short courses are offered in the winter.

Extension courses are conducted at various points throughout the state.

Four special research institutes have been organized: the Agricultural and Engineering Experiment Stations, and the Veterinary and Industrial Science Research Laboratories.

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Ames, Iowa.